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Computer games, schools, and young people

A report for educators on using games for learning

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Acknowledgements

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This report, a 'scenarios' poster, and further information are available at:
www.futurelab.org.uk/projects/games-and-learning.

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Summary

This report focuses on the use of games as resources to support the educational aims, objectives and planned outcomes of teachers who understand that games are an important medium in contemporary culture and young people's experiences.

The report provides an assessment of game-based learning in UK schools. It is intended to 'test out' the hype and enthusiasm for using games in education, and to identify a sensible rationale and practical strategies for teachers to try out games in the classroom. It is aimed at classroom teachers working in primary and secondary schools, as well as relevant agencies such as teacher training institutions, and policy makers (particularly those addressing the Byron Review). The focus is mainly on the use of games designed for entertainment purposes and their use in schools, rather than on games designed for educational reasons. Further and higher education are outside the scope of the report.

A number of dominant theories to support the educational use of games have emerged from the research literature in recent years. Relevant publications have established games as a 'persuasive medium' with the capacity to influence players' thoughts and actions; games have been described as 'constructionist' technologies for learning; games have been seen as ideal environments for practising skills; and games have been seen as an important format for consideration in 'media literacy' education. In addition, there are many persisting debates about how games are affecting young people. It is argued in some quarters that games are preparing young people to be successful workers and citizens in the 21st century; while in other quarters critics suggest that games perpetuate consumerist ideals and 'colonise' children's attention and desires. The report analyses the role of games in schools against the contextual backdrop of these debates and disagreements.

Although the majority of young people do play computer games, according to available background data, gaming is by no means a universal activity in all young people's lives. Where games are played by young people, too, their preferences and habits are very diverse and cannot be generalised. Any attempt to make use of games in schools therefore needs to be sensitive to the diversity of interest and experience in gaming amongst students. The research included a self-completion survey of over 1,600 practicing classroom teachers in English state primary and secondary schools (with questions designed by Futurelab and conducted by the National Foundation for Educational Research [NFER] through its February 2009 Teacher Omnibus), 10 interviews with teachers involved in using games in school, and interviews with 10 small groups of children with experience of game-based learning.

The teacher survey shows that:

- 35% of the sample of UK teachers have already used computer games in their teaching
- 60% of teachers would consider using computer games in their teaching in the future.

The mostly commonly cited reasons for considering using games in the classroom were for motivation and engagement reasons. The majority of teachers believe that computer games can help support children's cognitive development, their ICT development, and their higher-order thinking skills (such as logical thinking, planning and strategising). A little under half of all teachers think that playing computer games can lead to young people developing antisocial behaviours.

In terms of hardware for gaming in schools, the vast majority of teachers with previous experience in this area have used school PCs or laptops. The most popular gaming console used in schools is the handheld Nintendo DS (8% of teachers who have gaming experience in school have used such a device). This suggests that affordability and portability are emerging considerations, although the availability of games such as Dr Kawashima's Brain Age on the DS may, perhaps, be viewed as more obviously 'educational' than most other commercially produced games titles.

Teachers surveyed perceive a number of significant barriers to the use of games in schools. The dominant barriers are logistical: the high cost of hardware and software and a lack of licensing agreements meaning game titles can only be played on one PC. Teachers

were also concerned that there is a persistent lack of knowledge in the profession about how games might be used for educational purposes, and that many young people may not be able to make the connection between gaming and learning.

Teacher interviews demonstrated that teachers view the use of computer games in the classroom in practical terms related closely to existing educational aims. In many cases, games have been used to stimulate children's literacy learning, their design skills, and their communication. This approach was referred to as 'retro-fitting' games to educational objectives. It often made constructive but quite limited use of games themselves, with the focus being on the range of learning activities that can be designed to complement and extend on the content or subject matter of games.

Some interviewed teachers sought to provide a more subtle and productive description of games as motivating and engaging technologies. Rather than seeing games as a 'fun' incentive for learning, they viewed games as an integral part of many young people's lives that it is the teacher's duty to understand and to engage with in the classroom. In this sense, games provide a 'window' onto young people's lives, experiences and social practices outside school, and should be considered as worthy of consideration in the classroom.

Social interactions and relationships were seen by some of the interviewed teachers as having been positively enhanced by game-based learning activities in the classroom. This was articulated in terms of social interactions between students, and between students and their teachers, and was felt to be an important and often overlooked aspect of game-based learning in schools. Relationships between teachers and students during game-based activities were felt to be strengthened because young people were able to take increased personal and collaborative 'ownership' of activities, with teachers granting them greater responsibility and recognition of their media knowledge.

For some teachers, the rising importance of computer games as a medium in contemporary popular culture means that young people need to develop their 'media literacy' competence so that they are able to critically evaluate the role of games (as well as other media) in the modern world. Emerging practices to support media literacy around gaming involves young people as creative producers of games, allowing them to develop the skills of media production as well as understanding their significance in society.

The role of parents is significant in schools using games in the classroom. Some of the teachers interviewed have actively developed parental engagement strategies to ensure that parents understand the role and purpose of using games in school. This has included showcase evening events with students demonstrating their achievements in game-based learning, as well as personal correspondence with concerned parents. These attempts to engage with parents are related to a wider lack of understanding about games amongst the public, and to controversies and 'media panics' about games as a socially corrupt and deviant medium.

Teachers are concerned to ensure that there are mechanisms in place to maintain children's safety while accessing games media. Many of them claimed that safety is an issue shared by schools, parents and regulators, and that each has a different role in making sure children are accessing appropriate games content.

The success that teachers attribute to the use of games in schools is in many cases the result of effective local strategies which have enabled staff to take risks in the classroom. In Scotland, Learning Teaching Scotland has actively promoted gaming in schools, including funding a games and learning centre for excellence. This has provided teachers with the 'permission' to try out games in the classroom, and has allowed for the dissemination of practices to other settings. In order to maintain the impetus generated around games it is going to be important for 'games champions' working at local and national levels to disseminate examples of practice, provide training for staff, and liaise between key policy agencies, the games industry, local authorities and schools.

About this report

Audience

'Computer games, schools and young people: A report for educators on using computer games for learning' is intended to be read by classroom teachers, teacher trainers and training agencies, as well as policy makers involved in addressing the recommendations of the 2008 Byron Review. It provides research evidence about the use of computer and video games specifically in school settings, as well as discussions about the broader contexts for educational gaming. It is not a practical 'best practice' guide to 'game-based learning,' but a critical introduction to the challenges of using games for educational purposes in classrooms.

Throughout, computer games are viewed as a medium with great potential for use in education, as well as many significant implications. The focus is on how that potential might be achieved, and on the challenges that games bring with them, in the school classroom. Although the findings and arguments may be relevant in the further and higher education contexts, the research has been concentrated on schoolchildren between 5-16 years of age.

Aims

This report defines the use of computer games in school settings as resources that can support the educational aims, objectives and planned outcomes of teachers who understand that games are an important medium in contemporary culture and young people's experiences. It is intended to:

- introduce educational practitioners to the main ideas around using computer games in educational settings, especially school classrooms, including primary and secondary schools
- analyse the practical use of games in educational settings and teachers' views on game-based learning
- raise a number of implications, considerations and recommendations for the educational use of computer games.

It is the result of a nine-month research project which has identified how ideas about game-based learning have been constructed in the existing research literature and available evidence, and then compared these big ideas with the reality of gaming-related practices in UK primary and secondary school classrooms. It should be read as a review of the available evidence that has 'tested out' some of the dominant ideas for using games as an educational medium.

Computer games may have a positive role in young people's own leisure, but this report does not focus on playing computer games in the home or elsewhere: it specifically concentrates on gaming and learning in schools.

Written as an accessible guide to the rationale and practices of game-based learning, it identifies available evidence from existing research, and supplies some new and previously unpublished research on teachers' and children's experiences of using games in classrooms. A series of case studies of schools using games to support educational goals and outcomes is provided to illustrate how some teachers and educational professionals are already developing practices in this area.

While practicality is the aim, the report has been composed in such a way as to recognise that educators are professionals with different values, experiences and aspirations; a didactic step-by-step set of approaches or guidance to game-based learning is not given.

The use of computer games by young people, too, is highly diverse - encompassing those who play 'casually' for a bit of fun every now and then, to those who spend hours immersed in virtual online worlds - and so their expectations about gaming in education will be highly varied. Meaningful classroom activities that can enhance learning always take place in specific contexts, depend on the interactions of teachers and young people and on their immediate institutional setting, and relate to the wider social and cultural world.

Throughout, and mainly for the sake of simplicity, the terms 'computer games', 'videogames' and just 'games' are used interchangeably, except where specific distinctions need to be made - for example, with 'mobile games', 'serious games', or 'multiplayer online games'.

The focus is primarily not on computer games that have been designed specifically for use in education, but on the ways in which teachers have made use of existing, commercially available titles. The kind of 'drill-and-practice' games often referred to as 'edutainment' are not part of this study, although some of the teachers consulted during the project say they do occasionally use these.

Assumptions

Two basic assumptions underline the content of this report on computer games, schools, and young people:

- computer games are an important medium in the world today, especially amongst many young people
- as an important medium, games are worthy of consideration in schools.

Games are viewed throughout as cultural forms, not just as a sophisticated technology. What this means is that the playing of computer games has become a significant social and cultural activity [1]. In practical terms, playing computer games now accounts for lots of some people's time and impacts on where they choose to spend their leisure time (the bedroom, for example). Putting it simply, computer games (like any other medium) involve people interacting with media in a social setting.

The report takes a balanced view on the subject of computer games and gaming. It does not claim that games automatically or inherently possess educational potential, or that they automatically or inherently promote antisocial behaviours, ill-health, or deviancy. It recognises that not all young people play computer games, although many do, and that gaming is not a single unified activity but a vast array of practices and activities. It recognises that talking generally about 'games' is like generalising about 'books' and that there is a need for much more specificity if public appreciation about the value of games is to be developed.

[1] The term 'cultural form' refers to a technology as embedded in social practices and relationships; here it designates that computer games are significant because of the ways in which they are used by different people, not significant on their own. See Williams, R (2003) Television: Technology and cultural form (Routledge).

Frequent 'media panics' about computer games demonstrate the extent to which gaming can polarise popular opinion. Additionally, a huge multinational industry of development studios, publishers, hardware providers, marketing agencies, associations and conglomerates has grown rapidly in the gaming sector, demonstrating the significance of gaming in the commercial world. Games therefore need to be seen on a continuum from the bedroom to the boardroom, with their significance deriving both from individuals' enjoyment and from commercial development.

Although gaming is not exclusively the preserve of children and young people, games are particularly important to current discussions about how young people are growing up. What are the implications of growing up at a time when games have been available since before birth? And, moreover, what are the implications for the education of these young people? An additional assumption made throughout this document is that:

- children and young people are not just passive consumers of computer games, but actively discerning about them, and able to make up their own minds about their value.

The key challenge in game-based learning is to support children and young people to become increasingly sophisticated in their understandings about games, to be able to comprehend and interpret them. At home this means making informed decisions about the value and worth of specific games titles; in school it means identifying how games can be used to contribute to learning. Simply put, games are so overwhelmingly popular that at the very minimum schools should help young people to be able to understand them, just as understanding novels, science concepts, moments in history, and geographical phenomena are important to a young person's education. The focus throughout the report is on the ways in which computer games can be used by teachers in classroom-based learning activities to accomplish this aim.

The scope for such activity is broad, yet the evidence to date of how games are used in schools remains weak. The data and case studies reported here contribute to a realistic assessment about the extent to which computer games are a valid medium for use in formal education.

A great deal has been written and published in the last decade about how games can fundamentally transform learning, and, in fact, about how playing computer games may have already fundamentally altered the learning habits and aspirations of young people. For some educational critics, schools are simply not up to the task of teaching the important 21st century skills that young people are practising when playing games. Computer games, these critics suggest, are more effective for learning than schools. The problem here is that the enthusiasts do not believe schools can ever change, and see young people's gaming habits as educationally valuable in their own right. That allows these critics to ignore the reality of schools, and to speculate on a future world where young people are better educated by new media than by trained educators.

The view adopted in this document is less radical. The evidence collected during the project suggests that the reality of game-based learning in schools is far removed from the enthusiastic claims made about young people's learning with games outside schools. That does not make it any less valuable. This document is intended to provide a realistic view of what can be done with computer games in schools, for what purposes, and to what ends.

Scope

The report is organised in the following order to:

- introduce readers to the rationale and context for trying out games in educational settings
- identify the big ideas in game-based learning
- discuss key debates, arguments and criticisms in game-based learning
- present the reality of game-based learning from the field research
- raise a series of conclusions and recommendations for advancing the research and practices in game-based learning.

Largely outside the scope of the report are studies of young people's use of computer games in their own home settings. Where relevant, useful studies of gaming as 'informal learning' are signposted, but for clarity the main discussion is confined to gaming within the more formal settings of the school.

The research project

- This report is the result of a nine-month project carried out by Futurelab and funded by Becta. It is based on the collection and analysis of the following data:

- A self-completion survey with a statistically representative sample of 1,000 practicing teachers across the primary and secondary sectors, with questions designed by a Futurelab researcher and data collected by the National Foundation for Education Research through its Teacher Omnibus survey in February 2009. The survey provides a gauge to the extent of teachers' experiences of using games in classrooms, their aspirations for game-based learning, and their attitudes towards this kind of activity. A full report of findings from the survey, including thorough analysis, is available on the project website. Topline data is included in this report.

- Interviews with 10 teachers and 10 small groups of students at primary and secondary schools in England, Scotland and Northern Ireland in February 2009. The field research was carried out by two postgraduate researchers, using a semi-structured interview approach with broad question areas devised by a Futurelab researcher. All interview data was transcribed and analysed at Futurelab. The two postgraduate researchers compiled case studies from their discussions with staff and students. Schools were selected through professional networks as institutions known to the research team as having some existing involvement in game-based learning. No assumptions as to sample representativeness have been made. The case studies are included throughout this report, with excerpts from the interview transcripts included in the analysis.

- An expert roundtable discussion organised and chaired by a Futurelab researcher in October 2008, involving participants from educational practitioner networks, research, policy (including DCSF, DCMS and BERR), the games industry, and games-related publishing. Many of the major ideas around game-based learning were debated by this group. The entire discussion was recorded and transcribed, with this discussion data informing the analysis provided throughout the report.

- An extensive review of the literature on game-based learning, involving the collection of academic peer-reviewed journal articles, recently published books and chapters, as well as published academic research findings from game-based learning studies, and games industry market data. The literature and evidence were interpreted and reviewed, and key points of analysis are provided throughout this report.

The perspective adopted throughout is broadly on computer games as a social and cultural set of technologies and practices, rather than on their psychological, cognitive or neurological effects.

Why computer games and learning?

In this section three reasons are provided for thinking about why games might be used in an educational context. Firstly, games are a major part of many young people's lives already. Secondly, computer gaming is now interesting to policy makers, who are seeking to understand how this powerful medium can help modernise the education system. And thirdly, despite a lack of evidence, there is a growing amount of commentary on how playing games is itself educational.

The games market and young people

Playing computer games has become a massively popular worldwide activity. With international markets for computer games comparable with markets for movies and music, gaming has become a mainstream activity rather than simply a habit amongst male teenagers. A major research study in the USA indicates that 97% of young people aged 12-17 play computer games (99% of males and 94% of females)[2]. Figures for the UK show that:

- 37% of the entire 16-49 UK population play computer games
- 78% of 16-19 year-olds play computer games
- less than 5% of those aged 50+ play games[3]
- 87% of 8-11s and 88% of 12-15s play games on a games console at home[4]
- 55% of games players are male and 45% female[5].

Although a large proportion of children and young people do play computer games, not all do. It should never be presumed that computer games have become a 'natural' part of young people's lifestyles. That said, with over four-fifths of 8-15 year-olds and over three-quarters of 16-19 year-olds playing computer games, there is compelling evidence that gaming is a culturally and socially significant youth activity.

The motivations for young people to play computer games, and their overall playing habits, are too diverse for generalisation. An interview-based study in the UK found that children start playing games between 3 and 7 years of age. Most young people report playing games because they are fun as well as challenging, and competitive as well as relaxing or 'de-stressing'. Significantly, many claim that they find games mentally stimulating, more so than television for example, and that they enjoy this stimulation. There are some different patterns of usage between males and females, with younger boys more likely to play for longer than girls of a similar age, and girls less likely to play games based on shooting, fighting or sports, although these differences are not universal[6]. Computer gaming is not confined to young people or enjoyed by all of them, but the youth market clearly remains dominant.

Given the widespread and diverse uses of games amongst young people, it is perhaps more significant simply to state that computer games are as much a part of the media culture young people are growing up in as television, film and music. In the vast majority of school classrooms, therefore, the majority of students are likely to play computer games.

Obviously, one of the first tasks that is necessary in the field of young people's gaming is to map the terrain and locate in it sensible points for navigation. In a volume on youth, games and learning, for example, it is stated that the "debate around the value of games and gaming" has been, "to date, overly polemic and surprisingly shallow"[7]. This statement is a reminder that gaming itself is not well understood. It also demonstrates how a decent grasp of the implications of gaming must take account of such diverse factors as design aesthetics and marketing as well as young people's playing habits.

Games and education policy

Educational policy makers in the UK have remained largely circumspect about the role of computer games in education. Indeed, computer games have been treated, at best, as a harmless pastime and, at worst, as a social

[2] Lenhardt, A et al (2008) Teens, Video Games and Civics, Pew Internet & American Life Project (Pew/MacArthur).
[3] Nielsen Games (2008) Video Gamers in Europe - 2008 (ISFE).
[4] Ofcom (2008) Media Literacy Audit: Report on UK children by platform, available online www.ofcom.org.uk/advice/media_literacy/medlitpub/medlitpubrss/ml_childrens08/cannex.pdf
[5] Pratchett, R (2005) Gamers in the UK: Digital play, digital lifestyles (BBC).
[6] From research reported by Cragg Ross Dawson (2007) Video Games (BBFC).
[7] Salen, K (2008) Toward and Ecology of Gaming, in Salen, K (ed) The Ecology of Games: Connecting youth, games, and learning (MIT press)

danger. Some recent Government-commissioned reviews have begun to challenge this lack of engagement with games as a potentially educational media.

Byron Review

In March 2008 the British Government published the findings of the Byron Review, an inquiry into the effects of computer games and the internet on young people that had been commissioned in September 2007. Headed by Tanya Byron, a well-respected child psychologist and television personality, it states that, since "video games and new technologies" are seen to possess "enormous potential to have a positive impact on children":

- "Research is needed to dissect the factors that benefit the child, including an analysis of the 'engaging' elements of play and contexts in which educational learning are boosted when they take place through technology."

It adds that there is a need for a "focus on the nuances of games and the engagement of play":

- "In order for research to be informative for policy, it needs to break down and begin to understand the nuances of the games – differences in content, context, play length, realism, repetition and interaction, which will all potentially have a bearing on the game's impact"[8].

Although the potential of games in the review is countered by concerns about safety and suggestions to the effect of more stringent regulation across all new media, overwhelmingly the message emerging from the report is that children should be supported to understand the risks associated with new media, rather than a message about protecting them from it altogether. It specifically highlights the developmental need for children to experience risk rather than to be brought up entirely risk-averse, and concentrates on their well-being instead of on any perceived harms that new media, including games, might potentially exert. It very specifically states that evidence about the effects of violent video games in stimulating aggressive arousal is disputable, for example.

What all of this suggests is a significant policy need for research which interrogates the role of computer games in supporting a safe risk-taking and well-being agenda. Given that well-being is a major plank in the Government's strategic Children's Plan and Every Child Matters reform agenda, it is perhaps unsurprising that Secretary of State for Education Ed Balls promised to make every recommendation of the report a policy priority and that Prime Minister Gordon Brown has invited Tanya Byron to conduct a four-year review of progress on implementing them. Early in 2009, the UK Council for Child Internet Safety set up a sub-group dedicated to taking forward the recommendations around gaming from the Byron Review.

The Byron Review has the consequence of moving the concern around games from one of 'protection' to one of 'education', and this is commensurate with the larger Government reform agenda for children's services where the focus is on self-responsibility and well-being. Not only is this a question of educating children, either; it implicitly suggests that parents need educating and supporting to understand computer games, something reflected by the need for clearer age-ratings classifications[9]. The report recommends 'media literacy' education to address children's safety and understanding of new media; it might also be suggested that it demands some sort of media literacy scheme to address some parents' existing lack of knowledge about games, something to be addressed by a recommended public campaign. This is a complex shift of emphasis, not least because media coverage on the review and public appreciation of its key arguments was highly polarised.

Markets and children

Another important and ongoing Government-commissioned inquiry, expected to report in 2009, is a study by the Centre for Youth, Media and Children at the Institute of Education on the effects of the private sector on children. The implication of this inquiry in relation to work on games and learning is that games are obviously the products of major successful multinational corporations, and their appearance in formal education should therefore be subject to scrutiny. Computer games

[8] Byron Review (2008) The Byron Review: Safer Children in a Digital World (DCSF Publications).

[9] For example, the review found that some parents believed the existing PEGI classifications referred to the level of skill required to play the labelled titles, rather than their content appropriateness.

circulate in popular culture as a powerful medium produced by organisations whose primary business orientation is not to education but to entertainment and leisure, and fundamentally to the economic bottom-line[10]. Any debate about games and learning must be attendant to criticisms about the games industry's influences.

Serious games

Several examples of 'serious games' designed to meet public policy needs have been produced in the last few years. Some have been specifically commissioned by Government departments and by broadcasters. For instance, Rolling Sound was able to fund its youth-led project Soul Control through a short-term Mediabox grant funded by the DCSF, and its project Dead Ends was funded by Channel 4 to market its season 'Disarming Britain'. A meeting of the Alliance for Digital Inclusion in summer 2008, however, found that there is not currently a coordinated approach across Government to exploit gaming technologies for public policy purposes, and that the design of games with a serious purpose often owes more to enthusiastic and creative people within industry, third sector and local government. The group found that Government sometimes conflated 'gaming' with 'gambling', considered games to be 'superficial' and suited only to young children rather than older learners, and called for more research evidence that could convince policy makers of games' potential significance in education[11].

There is growing consensus at a policy level that games deserve to be treated seriously as possessing educational potential, and repeated calls for evidence to demonstrate it. This interest in computer games needs to be seen as one aspect of the current drive to modernise the education system, to make it more responsive to children's existing experiences and interests, and, more importantly from a political perspective, to ensure that young people are being educated with the skills they need to be successful in the 21st century.

The evidence gap in young people's gaming and learning

Although policy makers are beginning to take notice, there remains significant ambiguity about the appropriateness of computer games as educational resources for use in the classroom. The lack of concrete empirical evidence is a major contributing factor to this ambiguity. To date the evidence that young people are experiencing educational benefits from playing computer games remains weak, not least because there is little consensus about what constitutes 'educational benefit'. Clearly, studying a game in the same way that a novel or poem can be studied might have educational benefit in English or media studies. Using a physics simulation in science might have similar benefits. What is more debatable is the view that computer games make better educators than school teachers, if only in limited ways.

For example, interesting 2008 data collected by Ofcom of a sample of 12-15 year-olds shows that while 67% agreed with the statement "violent computer games can affect people's behaviour outside the game," only 49% agreed that "the skills you learn playing computer games are useful in everyday life"[12] This suggests, firstly, that many young people have absorbed the dominant messages in the media about the alleged influence of violent computer games on players' aggressive arousal, and secondly, that many young people cannot see the connections between computer games and skills acquisition or learning.

The absence of credible data to support using games for educational purposes has not dissuaded a good number of games advocates from making major claims about their value. Such claims are recycled repeatedly, despite being based often on little more than anecdotal evidence or personal experience[13]. It has, then, become increasingly common to hear arguments about their inherently educational qualities. Computer games, it is regularly argued, are an ideal platform for learning at a time when young people's access to ICT is proliferating and their digital media experiences are accelerating[14].

[10] A particularly critical account is provided by Barber, B (2008) Consumed: How markets corrupt children, infantilize adults, and swallow citizens whole (WW Norton).

[11] From notes following ADI (2008) Can the Games Be Serious? Guildhall, London, 5 June.

[12] Ofcom (2008) Media Literacy Audit: Report on UK children by platform, available online www.ofcom.org.uk/advice/media_literacy/medlitpub/medlitpubrss/ml_childrens08/cannex.pdf

[13] For a critical account see Buckingham, D (2007) Beyond Technology: Children's learning in the age of digital culture (Polity).

[14] A notable example is Prensky, M (2001) Digital Game-Based Learning (McGraw-Hill).

In addition, publications on the subject of games and learning are often produced in lieu of any real research evidence, and sometimes interpreted as if they constitute fresh intelligence[15]. It has also been claimed that researchers in the field of games and learning suffer from intellectual amnesia, neglecting to recall that there is a long history of prior research and publications in the field[16]. Indeed, this is not the first document Futurelab has produced on the subject of games: a comprehensive literature review preceded it in 2003 and a small handbook for teachers in 2005; a substantive report on the Teaching with Games project and a set of teaching resources followed in 2006[17].

So why games and learning?

This report contributes to the debates and the practices around games and learning by providing field data detailing the reality of game-based learning in school classrooms. Throughout, the emphasis is on understanding the reality of game-based learning as it occurs in primary and secondary schools. Although much has been written on the educational benefits of gaming outside school, in the sense that they are good tools for informal learning, the focus here is specifically on schools because it is schools that are the focus for policy making.

If Ofcom's data on children's perceptions of the negative aspects of gaming and the mismatch between gaming and real-life skills is accurate, then clearly educators face a challenge first and foremost in developing credible arguments to support the use of games in schools. It is often assumed that young people are automatically engaged by computer games and that this is reason enough to import them into classrooms. But such claims need to be treated more cautiously, and the collection of credible evidence has heightened importance.

The report addresses the Byron Review by supplying fresh evidence of how and why some schools are beginning to explore the use of games for formal educational purposes. The data presented later explores the benefits for children that teachers have identified in game-based learning, and demonstrates what sorts of risks these teachers foresee from educational gaming. Indeed, 'e-safety' is a major concern for educators at the present time. Before presenting the data, the next sections provide a critical commentary on some of the dominant ways in which gaming and learning have been allied with one another. The purpose of identifying these 'big ideas' is to then show how the reality of game-based learning in UK schools either confirms them, or demonstrates a significant mismatch.

[15] See Kirriemuir, J (2007) Groundhog Day for Games in Learning, Digra Hardcore Column, 3 March (www.digra.org/hardcore/hc13).

[16] See Egenfeldt-Nielsen, S (2006) Overview of research on the educational use of games, Digital Kompetanse, 3(1): 184-213. Other literature reviews are available from: Kirriemuir, J and McFarlane, A (2004) Literature Review in Games and Learning (Futurelab); Mitchell, A and Savill-Smith, C (2004) The Use of Computer and Video Games for Learning: A literature review (LSDA); Pivec, M and Pivec, P (2008) Games in Schools: Literature review (EUN/ISFE), available online: games.eun.org.

[17] See www.futurelab.org.uk.

Big ideas in games and learning

This section provides an examination of some of the key influential ideas in game-based learning. It establishes these ideas as paradigmatic ways of approaching the use of games for educational purposes within schools, with the intention that these will be 'tested out' against the evidence collected in schools during this study. Four 'big ideas' are described: games as a persuasive medium that can affect young people's thinking; games as a constructionist technology; games as providing environments for authentic activity; and games in the context of 'media literacy'.

Games are persuasive

A good place to start when considering the big ideas for using games in schools is to recognise that games are highly persuasive media products. Simply put, the ways in which a game is composed to be played establishes sets of routines, rules and actions that the player needs to learn in order to succeed. In this way, games do a similar job to persuasive speaking and debating, which seeks to influence the beliefs and behaviour of people[18].

Computer games are also a dynamic and interactive medium. Players participate, at least in part, in what happens. In a game like SimCity this is especially obvious, because players create their own working urban environments. Yet at the same time the design of the game ensures that things work to certain predefined rules. So like listening to a persuasive argument, a game persuades the player to carry out specific actions within the game itself.

To think of games as persuasive therefore means recognising that games have the power to influence people's thinking, and to make them think about things in certain ways. For many games this may well be inconsequential, but in other ways it may have important ramifications. A good example is how certain games depict the aesthetic 'look' of females. Many games typically represent females as highly sexualised figures, usually marginal to the main action, with the consequence that females have generally not played computer games as much as males, although this situation is changing[19].

Perhaps the major consequence of seeing games as persuasive is to recognise how they might be used for purposes other than pure entertainment. Marketing agencies have recognised this persuasive power and use games to help sell products through the creation of 'advergames'; they persuade people to buy products. Examples also exist of computer games designed for specific social purposes, intended to persuade players about important contemporary issues such as injustice and the consequences of ideological conflict. The web game September 12, which depicts the consequences of military conflict in the Middle East, is a good example of a 'social purpose' game, and is available on a website called NewsGaming[20].

Seeing games as a persuasive medium reinforces their importance within the school curriculum and in classroom practice: games, like any other medium, help shape the way people act in the world, and therefore need to be understood as an effective communication technology. It demonstrates that players need to be aware of what messages games developers are deploying through the content, structures and rules of specific titles. It shows how young people need to become aware of how games are used for a variety of purposes, including the advertising and selling of products through 'advergaming'. And it also indicates how games can be used to reinforce other, more socially conscious ideas and messages. Some examples of 'serious games' designed for specifically educational purposes can be seen as persuasive in that they guide players towards learning outcomes. The data discussed later shows how teachers have made use of the persuasive power of commercial computer games in the classroom.

[18] See Bogost, I (2007) Persuasive Games: The expressive power of videogames (MIT Press) and Bogost, I (2008) Unit Operations: An approach to videogame criticism (MIT Press).

[19] For a discussion of gender representation in games, see Carr, D (2006) Games and Gender, in Carr, D, Buckingham, D, Burn, A and Schott, G, Computer Games: Text, narrative and play (Polity): 162-178.

[20] See www.newsgaming.com/games/index12.htm.

Games support the construction of knowledge

If games can be used to market and sell products, can they also be used to promote educational content? The idea that children learn best by constructing ideas and knowledge through activity alongside others has a rich history in educational research and theory. Broadly speaking, this notion of 'learning-as-constructing knowledge' emphasises how children's development takes place through participation in a social world and interaction with people, events and objects. For some games and learning enthusiasts, games are viewed as ideal platforms for trying out ideas, making decisions, communicating with others, and of exploring or making new worlds.

According to this perspective, through the act of playing games, players are active in the construction of knowledge, rather than its passive recipients. This view therefore reinforces the notion of schools and classrooms as spaces for experimentation and focuses on the ways in which people learn by constructing knowledge actively alongside others, rather than by receiving knowledge passively from others, namely teachers. These kinds of activities are characterised by spaces to explore, room for learning through both success and failure, feedback that learners can use to adjust their own understanding, and multiple possible outcomes. They often take the form of problems that learners are motivated to solve in unique and active ways[21].

In some of the games literature this model of learning is sometimes called 'constructionism'. Constructionism is chiefly associated with the work of Seymour Papert and colleagues at MIT in the US[22]. Indeed, Papert's writing on computer games suggests that they are "empowering children to test out ideas about working within pre-fixed rules and structures", and that they "teach children what computers are beginning to teach adults - that some forms of learning are fast-paced, immensely compelling, and rewarding"[23].

Learning with games is said to be social, to involve interaction with objects, to be active and participative rather than passive and merely receptive, and to involve the constant construction of meaning and knowledge. Putting it very simply, you don't find out about computer games by being told about them, you find out about them and figure them out through playing with them; 'making' or 'constructing' meaning through the process of play. It is the alleged complexity and the diversity of the interactivity with computer games which is claimed to motivate children both to play games and to learn from playing them. Although these claims may be disputable (for example, playing a game may well allow players to construct knowledge that is socially or morally questionable), they are persuasive and influential.

In the classroom, a constructionist approach to game-based learning might involve working as a team to create and model a complex system. The game Civilization, for example, requires players to manipulate economics and resources in order to manage the growth and progress of a population. A specific MIT product, Scratch, has been produced to allow users to construct their own computer games and share them with others on the web. It is intended to help children and young people learn important '21st century skills', including mathematical and computational ideas, thinking creatively, systematic reasoning, and collaborative working[24].

Games are authentic practices

Perhaps the most influential work on games and learning to date has emerged from researchers and theorists who view playing games as 'situated practice'. Situated practice refers to the notion that learning occurs most successfully when it takes place in authentic contexts rather than decontextualised settings. Playing computer games is regarded as situated practice while learning knowledge to take tests in a classroom is regarded as divorced from learners' daily experience.

[21] Klopfer, E (2008) Augmented Learning: Research and design of mobile educational games (MIT Press).

[22] See Papert, S and Idit, H (1991) Constructionism (Ablex Publishing). The introductory chapter to this volume is available online: www.papert.org/articles/SituatingConstructionism.html.

[23] Papert, S (1993) The Children's Machine: Rethinking school in the age of the computer (BasicBooks).

[24] See scratch.mit.edu.

Furthermore, computer games are authentic contexts for learning because they demonstrate all the 'multimedia' features of modern technologies and media. From this perspective, traditional schools stultify children's capacities by forcing them through formal routines and standards that have no bearing on or relevance to their everyday lives. This kind of research on games is mainly associated with the University of Wisconsin-Madison in the US.

This assumption is based on the notion that what schools teach today is out of date and ill-suited to a changing world where ICT is taking on enhanced importance. In this view, schools are continuing to perpetuate an outdated paradigm of educational activity where curricular knowledge is transmitted from the teacher to students, where everyone learns at roughly the same pace and in the same place, and where the really high stakes are placed on eventual written examination performance.

Computer games, on the other hand, help players to practice their problem-solving and decision-making skills, to multi-task by dealing with many different 'inputs' and 'outputs' at once, to collaborate by teaming up with other players, to take risks and experience failure in a safe environment, and, overall, to develop the sorts of skills suited to 21st century living and working. Arguments in this direction see schools as a problem to be fixed, and computer games as providing an alternative educational space.

According to this view, games are designed to be learned. As a player, if you cannot work out what actions you need to take to play a game successfully then you will eventually give up; games designers thus make games in such a way as to ensure players can get started and then gradually build up their skills through the processes of play. Playing games represents a process, it is argued "that leads to better and better designs for good learning and, indeed, good learning of hard and challenging things". This is because games are ideally suited to practising things over and over again in authentic contexts. This means learning and practising skills at the point of need, as and when appropriate[25].

If this is the case, then it should be possible to use games educationally to introduce young people to the skills, practices and expertise of specific professions. Two examples of games being used in this way are Urban Science and Pandora. In Urban Science, players engage in the professional practices of urban planning and learn how to become ecological thinkers in the process. They work together to tackle the urban issues that face their city, using iPlan, a Geographic Information System (GIS) tool that helps them develop a comprehensive plan for their community. In The Pandora Project, players become high-powered negotiators, deciding the fate of a real medical controversy: the ethics of transplanting organs from animals into humans. Along the way, they learn about biology, international relations and mediation[26].

As such, the playing of computer games can provide learners with access to professional expertise, developing some level of knowledge of the practices appropriate to it. This approach aims to show how games can be more authentic than school, featuring more realistic and more meaningful ways of thinking about problems that matter in the world.

It is intended to allow learners to develop the skills, knowledge and values that professionals use to think in innovative ways. Learning these through professional training and practice is very different from the experience of learning in schools, particularly in an education system under pressure to meet test standards. Using games for educational purposes can, it is argued, allow learners to adopt the identities and practices of professional innovators in a variety of fields[27].

Gaming can promote media literacy

'Media literacy' refers to the ability of learners to be able to read and produce media, in the same way that 'print literacy' refers to one's competence in reading and writing conventional printed texts. However, media literacy is also overtly political because it focuses on understanding how media are produced, for what purposes, and to what effects. It means grasping how media organisations operate, how audiences receive and respond to different media, and how the exchange between media producers and consumers impacts on social relations and culture.

[25] Gee, JP (2003) What Video Games have to Teach Us About Learning and Literacy (Palgrave MacMillan).

[26] For details see epistemicgames.org.

[27] Shaffer, DW (2006) How Computer Games Help Children Learn (Palgrave MacMillan).

It should be noted that media literacy is especially important to the discussion of games and learning because its main advocates at the Institute of Education in London were commissioned to contribute to the Government's Byron Review.

Media literacy is intended as a direct approach for use in schools, which should permit students to develop both the critical understanding of how to **read** media and the active participation of writing or producing it, and it is part of a wider move towards democratisation, a process whereby students' out-of-school cultures are gradually recognised as valid and worthy of consideration in the school curriculum. Media literacy is thus seen as a form of preparation for children to make informed sense of media on their own behalf, rather than a form of protection from what are often perceived to be their negative or even harmful influences[28].

Advocates of media literacy approaches to learning consider all media audiences, including very young children, to be active and participative, making meaning out of the media they use rather than passively receiving and accepting content from media outlets. Two aspects of media literacy are important in relation to games: critical consumption and creative production.

The first, critical consumption, refers to the ways in which children consume and interpret games in relation to cultural contexts. The tastes, pleasures and opinions of children are always changing according to context and time. This means that in the study of how children engage with computer games, it is always important to take into account both the structure and possible meanings associated with a game, and the social and cultural specifics of audiences that may influence the way they interpret that game. It involves analysis, evaluation and critical reflection[29].

Thus, media literacy education involves asking questions about representation (how media offer particular interpretations of the world, whose voices and opinions they represent); about language (how media are constructed, designed and structured); about production (who is communicating to whom, and why, including an awareness of commercial influences, marketing, advertising, as well as other interest groups using media to persuade and inform); and about audience (how media are targeted at audiences and how audiences use and respond to them). All of these components are important in developing a critical understanding of how media are consumed.

Creative production refers to the ways in which children can themselves become the designers and creators of media. For example, the 'digital authoring' of games media is seen as a way of facilitating and supporting learners to develop their critical competences. Learners can develop their critical facilities because it is by constructing media that issues to do with its design, distribution, representation and audience emerge. In specific terms of games and learning, teachers can focus on different aspects of computer games in the formal classroom:

- Learning about the games industry: what companies are involved in the design, production, publishing and marketing of computer games?
- Learning about the narrative system of games: what is the narrative structure of a game, what generic characteristics does it have, what character types?
- Learning about ludic systems: what are the rules of games, how does this structure how they are played, and what pleasures and challenges do games construct?
- Designing games: students plan, design, produce and publish their own games, involving the manipulation and transformation of ideas from other games or media.

[28] Buckingham, D (2003) Media Education: Literacy, learning and contemporary culture (Polity).
[29] Buckingham, D (2008) Beyond Technology: Children's learning in the age of digital culture (Polity).

Games literacy is thus intended to support children to recognise and ask questions about how games function and how people create, use and engage with them. Media literacy concerning computer games in education is therefore important because it focuses on the persuasive potential of games on players and learners, recognising that the structure and content of some games may sometimes affect what players think and believe, while other times they may not[30].

Implications of the big ideas

This section has examined four ways of thinking about game-based learning. By seeing games as persuasive, educators should focus on the different messages that are transmitted by games, and their possible effects on players and learners. This implies locating games that have different persuasive intentions, including those designed for marketing ('advergames') as well as those developed with a more forceful social message. The game Climate Challenge developed by the independent studio Red Redemption is a good example of the latter. It simulates the political decision-making process that contributes to either exacerbating or alleviating climate change[31].

When games are seen as constructionist technologies, the emphasis is on educators supporting children and young people to construct knowledge together by experimenting with systems. Game systems such as SimCity, Spore and Civilization are good examples because they focus on the process of building systems, trying out various structural arrangements, and then revising those arrangements based on either successes or failures.

Similarly, to view games as situated and authentic practices means using them in the classroom to introduce learners to the practices and skills associated with specific areas of expertise. Some examples in this direction may seem frivolous, such as practising being a house-cleaning robot. Others seem closer to the kind of content teachers might need to teach, such as problem-solving in science. Emerging practices reported in this area have used games as a way of introducing learners to specific professional practices, such as urban planning and medical management. More informally, though, military games may be seen as introducing players to skills and knowledge of being a professional soldier.

Although media literacy approaches to game-based learning may seem most relevant to media studies education, it is important see media literacy as relevant across the entire curriculum. The major source for many people's knowledge outside the school curriculum is the mainstream media. Understanding how media constructs and communicates ideas and messages is therefore important to be an informed citizen. When it comes to games, it is important for learners to understand how games create and sustain ideas, who produces and distributes games, and how audiences receive and respond to games. This concern boils down to one central point: since people gain knowledge from media, they learn some knowledge from games, and therefore need to be able to interpret what they are learning from such games.

These approaches to games and learning are the most dominant in the existing research literature. In the section detailing findings from the present study, these ideas are 'tested out' against the data. To what extent do the practices identified in primary and secondary classrooms confirm the existing theories about games as a valid educational medium? First, however, it is essential to acknowledge that there are a number of critical debates that need to be considered by educators interested in games and learning.

[30] Burn, A and Durran, J (2007) Media Literacy in Schools: Practice, production and progression (Paul Chapman). See also McDougall, J and O'Brien, W (2008) Studying Videogames (Auteur).

[31] See red-redemption.com/news/.

Debates and criticisms in games and learning

This section provides a series of arguments, debates and counter-arguments about the role of games in young people's learning. These arguments are important in demonstrating that using games in schools is not a neutral activity: it is open to all sorts of differing opinions.

Just as there is no single orthodoxy for the study of games in general, there is no single accepted approach to game-based learning[32]. In this section of the report, a number of key debates about games are raised in order to better inform educators new to this field about the diversity of responses to games as cultural forms.

It is worth remembering that as long ago as 1982 Chris Crawford, one of the first computer games critics, predicted that the products of the games industry in the future would be divided between a mass market "wasteland" of "cyberschlock" and a "more exciting literature" of games as a "social force"[33]. Over two decades later these predictions seem accurate. Games have become a major recreational activity, sometimes considered - especially in the tabloid and conservative press - to be culturally degenerate, yet they have also become increasingly sophisticated and celebrated as cultural forms; they have shaken up the world of entertainment, and they have entered into educational debates and practices. How, then, do these debates contribute to the rationale for game-based learning?

Games and the economy

Computer games are increasingly considered important in education because, it is claimed, they are ideally attuned to developing young people's competences for a new era in which creativity and innovation are more important than curricular competence. From this perspective, children are learning important new skills informally from their new media and games experiences, while schools are failing to do so. Games seem, for many commentators, to be 'ideal learning environments' for changing times, seemingly able to prepare players to be successful in an increasingly turbulent economic climate.

As a consequence, it is increasingly asserted, schools need to change in order to equip children with the skills they will need to thrive. What the economy needs is creativity and innovation, and future personnel with the qualities to ensure that progress is sustainable[34]. Schools are no longer seen as "institutions training children for certainty; instead they will facilitate learning for a generation that can live and work in knowledge intensive organizations and institutions where they will have to rely on skills of flexibility and adaptability to cope with ever changing conditions and situations"[35].

This argument is in line with the suggestion that successful organisations are primarily concerned with the labour and knowledge of their staff, and that in uncertain times the most valuable human capital one can possess is to be adaptable to changing circumstances and conditions. It is not enough to possess one core set of skills and knowledge but necessary to be flexible and able to respond to new needs.

In concrete terms, it is now suggested that children are developing from computer gaming the necessary skills of multitasking, 'zapping' between different information flows, non-linear behaviours, learning through enquiry, and collaboration. As such, games are "perfect training for life" at a time when "daily existence demands the ability to parse sixteen kinds of information being fired at you simultaneously". Therefore, "kids weaned on videogames are not attention-deficit, morally stunted, illiterate little zombies," but "simply acclimated to a world that increasingly resembles some kind of arcade experience"[36].

[32] For example, games have been studied from a film studies perspective in King, G and Krzywinska, T (2002) ScreenPlay: cinema/videogames/interfaces (Wallflower); from a literary theory perspective in Kucklich, J (2006) Literary theory and digital games, in Rutter, J and Bryce, J (eds) Understanding Digital Games (Sage); from cultural studies in Wark, M (2007) Gamer Theory (Harvard University Press), and Dovey, J and Kennedy, H (2006) Game Cultures: Computer games as new media (Open University Press); and from ludology/play perspectives in Carr, D (2006) Play and pleasure, in Darr, D, Buckingham, D, Burn, A and Schott, G, Computer Games: Text, narrative and play (Polity): 45-58.

[33] Crawford, C (1982) The Art of Computer Game Design (available online: www.vancouver.wsu.edu/fac/peabody/game-book/Coverpage.html).

[34] See, for example, Leadbeater, C (2004) Personalisation Through Participation: A new script for public services (Demos).

[35] Veen, W and Vrakking, B (2006) Homo Zappiens: Growing up in the digital age (Network Continuum).

[36] Herz, JC (1997) Joystick Nation: How videogames ate our quarters, won our hearts, and rewired our minds (Little, Brown).

In some business management texts computer games are regarded as determining children's mental development and this, it's assumed, will change the structures and routines associated with economic activity in businesses. The argument is that because of the ways in which children's brains have adapted to playing games, then the ways they will run businesses and drive the economy in the 21st century are different to the old 20th century strategies[37]. These "post-industrialist capitalist economies are developing into cultures of 'play' in which a pervasive 'play ethic' is superseding the work ethic"[38]. 'Play' is therefore seemingly a new way of doing work, and playing computer games is preparing young people for new ways of working.

Computer games have become an important focus for thinking about learning, then, because they are seemingly changing the very fabric of the present; they are ideally suited to, and prepare children for, a new economic era that is based on the use of computers and other information and communication technologies. Indeed, computer games are regarded as the 'push' technology which will support children to use other computer technologies. Moreover, it is through gaming that young people are already gaining the skills required in a changed economic climate.

Digital childhood

In the educational context, it is often argued that because of the influence of technology and media, teachers cannot understand the children entering their classrooms. Therefore children are becoming increasingly frustrated by schools being out of step with their out of school pursuits, experiences and practices with media. In short, children are 'natives' to the new digital environment, and adults are 'immigrants'[39]. This position assumes that schools are outdated institutions that need to 'catch up' and 'match up' to the complex media worlds children are experiencing and learning from informally[40].

According to writers who subscribe to the view that children are native to a digital media environment, computer games are the most sophisticated popular medium around. "Kids are certainly not too stupid for school," one writer argues. "Perhaps school is too stupid for them. Too stupid, too slow, too uncolourful, too mono for a bunch of kids for whom speed, excitement, words, pictures, sound and film are all parts of acquiring and passing on information, all ways of telling stories... The form, content and method of knowledge delivery within schools is out of sync with the way that people learn elsewhere, with what they value, with what counts in the world"[41].

Similar arguments are made elsewhere. Children are considered to have 'evolved' into a new species, 'homo zappiens'. They are "active processors of information, skilled problem solvers using gaming strategies and effective communicators", and "consider schools as disconnected institutions, more or less irrelevant to them as far as their daily lives are concerned... In fact, Homo zappiens are digital, and school is analogue"[42].

This suggests that the focus in schools on absorbing content and skills is not only demotivating and irrelevant to what children are doing outside school with new media, but is also outdated at a time when information is immediately available and electronic communication is ubiquitous.

[37] Beck, JC and Wade, M (2003) Got Game: How the gamer generation is reshaping business forever (Harvard Business Press).

[38] Stone, AR (1995) The War of Desire and Technology at the Close of the Mechanical Age (MIT Press): 9. Stone is cautious about the implications of this shift towards a "play ethic", but others are far more optimistic. For example, see Kane, P (2004) The Play Ethic: A manifesto for a different way of living (Macmillan).

[39] Prensky, M (2001) Digital Game-based Learning (McGraw-Hill).

[40] A range of other terms related to children and new media do similar work, for example, 'cyberkids', 'digital generation', 'Nintendo generation', 'net generation', 'boom-echo', 'Google generation' and so on.

[41] Barham, N (2004) Disconnected: Why your kids are turning their backs on everything you thought you knew (Ebury Press).

[42] Veen, W and Vrakking, B (2006) Homo Zappiens: Growing up in the digital age (Network Continuum Education).

Perhaps the most well-known populariser of this type of games and learning argument is Marc Prensky, a US-based consultant, writer and designer of educational games and training simulations[43]. Prensky's argument is that "game-playing is as beneficial to children's development as reading" and that "kids learn more positive, useful things for their future from their video games than they learn in school"[44]. What this means is that because children have grown up in a world where computers, computer games, the internet and mobile phones have always existed they have developed qualitatively different ways of interacting in the world.

Dealing with complexity, experiencing failure in a low-risk environment, collaborating with others (often over the web), making ethical decisions, exploring different identities, and managing multimedia information simultaneously are some of the allegedly heightened cognitive competences of Prensky's digital natives. These competences are a continuation of the emergent ideas of childhood in the new media age, where young people are considered savvy, self-reliant, hungry for expression, analytical, articulate, creative, inquisitive, accepting of diversity and socially conscious. As Prensky optimistically puts it, games "offer up the most realistic vision of how everyone, young or old, will be learning and working in the decades to come".

These views need to be put in the context of a surge of publications that seek to energise debates about the merits of popular cultural forms. Another popular and influential text in this area is Steven Johnson's 'Everything Bad is Good for You: How popular culture is making us smarter'. He suggests that computer games are "good for the brain" because they "force you to decide, to choose, to prioritize. All the intellectual benefits of gaming derive from this fundamental virtue, because learning how to think is ultimately about learning to make the right decisions: weighing evidence, analyzing situations, consulting your long-term goals, and then deciding. No other pop cultural form directly engages the brain's decision-making apparatus in the same way."

Playing computer games requires mental labour that does not get practised in school, so that outside school children's "brains are being challenged at every turn by new forms of media and technology that cultivate sophisticated problem-solving skills"[45].

What these examples set out to demonstrate is that the popular culture to which children are daily exposed is composed of powerful media forms of which the computer game is the most advanced. By virtue of its interactivity, the computer game engages the brain in all sorts of complex tasks that schools do not. Thus, while schools simply transmit standardised content, computer games act to extend children's mental functioning. Computer games are, these commentators suggest, ideal environments for learning in the 21st century, already transforming young people's skills and preparing them to be successful in the 21st century.

The popular idea of children as digital natives has run up against inevitable criticism. Reservations about it include its generalisations and assumptions, its lack of evidence beyond the anecdotal, and its unwillingness to acknowledge that children have very different levels of access to new media of all kinds. As one critic has argued, "the optimistic view of young people as a 'digital generation' - as somehow automatically liberated and empowered through their experience of these new technologies - is little more than a form of wishful thinking"[46].

Assumptions that all players use computer games in a sophisticated way ignores questions about what games people are playing and in what contexts they are doing so. The majority of this kind of work comes from commentators who take an unquestioning view of social and economic change (and claim that schools need to 'catch up' and 'match up'); this means that these new ideas about children are motivated by the current economic consensus that technological progress is seen as key.

[43] Prensky maintains a professional website and a weblog at www.marcprensky.com as well as a site acting as a resource bank on games and learning for teachers and parents: www.gamesparentsteachers.com.

[44] Prensky, M (2006) 'Don't Bother Me Mom - I'm Learning!' How computer and video games are preparing your kids for 21st century success - and how you can help! (Paragon House).

[45] Johnson, S (2005) Everything Bad is Good for You: How popular culture is making us smarter (Penguin).

[46] Buckingham, D (2008) Beyond Technology: Children's learning in the age of digital culture (Polity)

Commercial interests

Some commentators have suggested that computer games need to be scrutinised as their origins, production and role in media culture are far from merely benevolent. For example, there are concerns that contemporary changes in the structures, routines and emphases in schools prove the emergence of an 'educational-industrial complex'[47]. What this means is that what goes on in schools is not just influenced by policy, research and practice, but by the interests of businesses.

The close alignment of education with gaming, then, suggests that the corporate organisations responsible for marketing games know more about how to educate young people than the state or its educators. This is troubling since the games industry depends for its future profits on assuring young consumers that their interests will be maintained by the games it produces.

Critics have pointed out, for example, that the term 'Nintendo generation' was developed as part of a high-intensity marketing and branding campaign by Nintendo itself, the aim being "to implant in consumers an ongoing awareness of and identification with the branding corporation". Games companies such as Nintendo act as 'colonisers', with 'the colonised' being 'the children who play the games'. This means that children's attention, time, desires, ambitions, and fantasies become attached to the Nintendo brand, from which they derive the pleasure of gaming but also "an array of metaphors, narratives and codes for the interpretation of life, and often a whole range of social activities - contests, conversations, clubs, etc. Minds, bodies, and social interactions are thus increasingly 'occupied' by Nintendo activities and purchases"[48].

Computer games should therefore be viewed as part of a complex of corporate marketing, branding and competition for market share in a consumer culture where major entertainment providers have a growing influence on the thoughts and actions of children, though it should be noted that this argument is itself contested for its pessimistic assumption that children are 'victims' of the corporate world[49]. The implications for schools are that using games for educational purposes may actually reinforce and legitimise the power of corporate marketing to influence children's minds.

In another analysis of how entertainment and advertising impact on education, it is argued that major media organisations have become a pervasive influence in children's lives to the extent that they compete with schools as sources of knowledge. Because television, the internet, computer games and so on have become so accessible, entertaining and persuasive, it is claimed that schools increasingly struggle to meet the high expectations of children. This is expressed in the demand for teachers and schools to embrace new technologies, to make lessons more fun and to improve the 'slickness' of their presentations:

> "In many ways, corporate pedagogues have become postmodern society's most successful teachers. Their pedagogies are voluptuous and are consumed hungrily by the young. The corporate curriculum has become the yardstick against which all other curricula are judged and found wanting... The corporate curriculum may have created school students who expect and get no pleasure from the formal aspects of schooling; a cohort of students who do not expect adults to say anything worthwhile except in purely instrumental terms; who are unlikely to take seriously what schools tell them; and who are unlikely to construct their identities through schools"[50].

[47] The term "educational-industrial complex" can be found in Brightman, H and Gutmore, D (2002) The educational-industrial complex, The Educational Forum, 66(4): 302-308. The authors use the term to describe the increasing role of private sector corporations and businesses in state education, and ask who benefits most from it. It is derived from the term "military-industrial complex" which refers to the close relationship between the "war-room" in the military and the "boardroom" in the arms and technology industries.

[48] Kline, S, Dyer-Witheford, N and de Peuter, G (2003) Digital Play: The interaction of technology, culture, and marketing (McGill-Queen's University Press).

[49] See a critique in Lister, M, Dovey, J, Giddings, S, Grant, I and Kelly, K (2009) New Media: A critical introduction, second edition (Routledge).

[50] Jane Kenway and Elizabeth Bullen (2001) Consuming Children: Education-Entertainment-Advertising (Open University Press).

While the authors are optimistic that there may be benefits to children's engagement with the entertainment world, they retain some caution about the effects this may have on what and how children learn. Corporate pedagogues, they maintain, tend to instil in children affective pleasures - excitement and emotion - rather than the pleasures of learning for its own sake. This is reminiscent of arguments about the 'work ethic' being superseded by a 'play ethic'.

For many children, the effect of exposure to games and other forms of new media may have been to make school seem more like a deadening chore, a purely functional series of presentations which should rightly be rejected and undermined by the playfulness of consumer culture. These arguments raise questions about the appropriateness of regarding computer games as ideal learning platforms for the 21st century. Furthermore, there are emergent concerns about the ways in which games simulate aspects of human experience, especially military and domestic activity.

Military and domestic simulation

Military simulation games such as America's Army are sometimes used as examples of ideal learning environments. The game, originally designed to promote recruitment to the US military, is freely available online and purports to provide an authentic introduction to military activity. America's Army is part of a complex of military simulation and training (or serious gaming) technologies[51]. Many of the design decisions made in the production of the game gloss over the reality and authenticity of military experience, and "ultimately the aim of the game is to nurture a positive, unquestioning attitude towards the US Army, and all the game designers' choices seem to support that". In addition, games produced in the Middle East that represent US forces as an 'enemy' have generally been treated with revulsion in the West[52].

This may seem at some distance from the debate about games and learning but it is important to remember that games are a persuasive medium that are influential in players' perceptions and, moreover, that for some commentators games are seen as perfect training for 21st century life and work in a changing society. If military simulations are ideal learning environments, then the model of game-based learning that is imported into schools risks perpetuating, however indirectly, a range of latent military ideas in the classroom.

The popularity of games such as The Sims, which simulates domestic life, seem to be shifting the balance away from 'militarised masculinity' in the games industry, but this, too, is not without contention. The "idea that military simulations provide training for soldiers is familiar", critics state; similarly, "what The Sims does is provide civilian simulator training for yuppies". The message of The Sims is that buying commodities is key to human contentment. Everything in the game requires the purchasing of more and better objects. "The Sims live in a perfect consumer society where more stuff makes you happier, period. There is nothing else. So your goals in SimLife are purely material. Work your way up the job ladder so you can earn more money, so you can buy more furniture, a bigger house and more toys."[53].

Admirers of The Sims insist that it simplifies a complex real world into a microcosmic simulation and thus invites players to examine their own lives. The Sims therefore provides the appearance of social critique whilst continuing to perpetuate consumption as an idealised way of life.

[51] For example, see the September 2008 issue of the official US Army magazine, Soldiers, which features articles on a range of serious gaming, simulation, and other 'non-kinetic' training technologies: lists.army.mil/soldiersmagazine/pdfs/sep08full.pdf. The main feature article describes a long history of military simulation and gaming, and states how the US Army now transports mobile 'gaming labs' so that soldiers can train for a range of scenarios and modify missions based on their own real-life experience in the field.

[52] Mileham, R (2008) Powering Up: Are computer games changing our lives? (Wiley & Sons Ltd): 264. Interestingly Mileham's analysis of America's Army in the context of the official US Army website where it can be located shows how game-style graphics are used to depict apparently real examples of military heroism, thus producing a "world where you're not sure what's real and what isn't".

[53] Herz, JC, cited in Kline, S, Dyer-Witheford, N and de Peuter, G (2003) Digital Play: The interaction of technology, culture, and marketing (McGill-Queen's University Press).

Implications of the debates

These arguments and debates remind us that learning from games involves negotiating a complex set of messages. Games may be 'ideal learning environments' for a certain type of education system, but it is not a model that is neutral or wholly benevolent. Game-based learning activities need to be attentive to these kinds of criticisms in order to support young people to make sense of games on their own behalf.

A useful way to think about games and education is to consider games as persuasive media that can influence players in different ways, that can be used to allow interaction and experimentation with various practices, and that need to be the focus for the development of young people's own evaluative, critical and creative powers. The focus for game-based learning should always be on enabling young people to make sense of games, and to use them in productive and constructive ways. The emphasis is on what young people are able to do with games media, as well as on how games may affect and influence them. In the following section the data on how games are being used in real classrooms is analysed.

Realities in games and learning

This section provides an analysis of game-based learning as it is actually occurring in UK primary and secondary schools. It identifies whether the big ideas described in the previous section are influencing game-based learning in the classroom, or whether schools are working with other aims and with other intended outcomes. So, do teachers view games as persuasive devices? Do they use games to promote the construction of knowledge? Do they use games as a way of providing students with situated and authentic experiences? And do they use games to enhance students' media literacy?

The data

The data include a survey of 1,634 statistically representative teachers in England, 10 teacher interviews, and 10 small-group interviews with children in primary and secondary schools in England, Scotland and Northern Ireland. The survey data provides topline statistics on the use of games in schools, as well as teacher attitudes towards educational gaming. Survey questions were designed by a Futurelab researcher and included on the NFER (National Foundation for Educational Research) teacher omnibus in February 2009. These data were collected from teachers in maintained primary and secondary schools in England only[54]. The interview questions were written by a Futurelab researcher, with fieldwork conducted by two PhD researchers.

This data has been analysed at Futurelab through a grounded approach, which means the transcribed interview data has been read through thoroughly, with emerging themes, questions and issues then used as framing devices for reporting findings. The findings have been organised under a number of key themes, with key teacher statements included where relevant. This means that the teachers' 'voices' in the research have been included. Short case study examples have been provided detailing what game-based learning is occurring in the participating schools; these appear throughout the section.

That said, this sort of research is always rather messy, and other analytical methods may derive slightly different conclusions[55]. No attempt has been made to produce an analysis of the psychological or cognitive learning effects of gaming, for example. The focus is on games as cultural forms that have significance in young people's social worlds, and in the institutional context of the school. This focus is important because game-based learning in schools depends on institutional, personal and other social factors above all else. It depends on schools making an institutional commitment to gaming; on teachers making a personal investment in it; and on wider social implications such as young people's feelings about gaming, their parents' perceptions of the value of gaming, and even public opinion and press coverage of computer games.

Interestingly, the figures discussed below are highly consistent with figures collected during an earlier Futurelab study, Teaching with Games, which used a similar survey instrument with 924 teachers in 2006. The similarity of this data, although impossible to cross-reference directly, suggest that the figures are reliable and not a one-time anomaly[56].

Topline games and learning statistics

Teachers' uses of games

1,634 teachers in maintained primary and secondary schools in England completed the games survey. Of these, 72% were female and 28% male; 54% were from primary school teaching and 46% from secondary. The age breakdown was consistent from the mid-20s to mid-50s[57].

42% of teachers never play computer games for their own leisure; 34% play at least once a month or more frequently (21% play at least every week). Teachers are not therefore, in the main, a significant gaming population. The fact that over 40% never play games at all is likely to be a contributing factor to the lack of knowledge and skills in gaming often cited as a key reason for teachers not to use games in schools, although it is notable that just over a fifth of them do in fact play

[54] A full report providing analysis of the statistics is provided by NFER and available at www.futurelab.org.uk/projects/games-and-learning. Note that the data were weighted to ensure a balanced socio-economic sample.

[55] A good introduction to discussions of research methods is supplied by Law, J (2004) After Method: Mess in social science research (Routledge).

[56] For details and findings from the Teaching with Games project, see www.futurelab.org.uk/projects/teaching-with-games.

[57] Note that no detailed analysis has been conducted on this data; they are descriptive statistics only.

games on a weekly basis. The percentage of males who play computer games for their own pleasure is slightly higher than females: 21 % of male teachers play games every week, compared to 16% of female teachers, and while 35% of male teachers never play computer games, 45% of female teachers never do so. A small but potential significant gender gap is evident in the profession.

35% of all teachers surveyed (38% primary and 30% secondary) have previously used computer games primarily designed for entertainment purposes in their teaching; 64% state they have never done so. Although the difference between primary and secondary school teachers is not enormous, it is clearly significant that primary school teachers are slightly more likely to use games in the classroom. From the interview data described later, it seems clear that teachers do not generally regard games as fitting neatly or specifically into single subject areas. This has ramifications for secondary school educators whose task is to teach subject disciplines.

Notably, too, a slightly higher percentage of male teachers than female teachers have experience of using games in school (38% compared to 34%), which is consistent with the gender gap between males and females who play computer games fort their own pleasure.

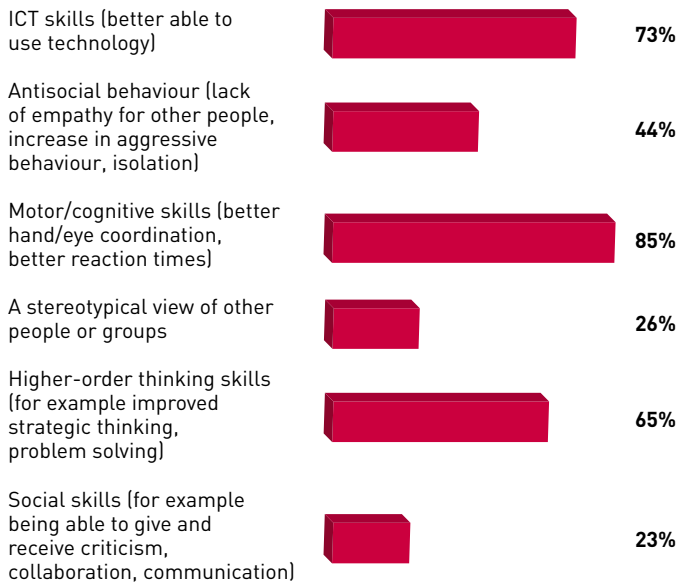
Of the 35% of teachers who have used games in school, the vast majority have used PCs or school laptops for gaming (90%). In addition, 8% have used a Nintendo DS device, 7% a Nintendo Wii, and 5% a Sony PlayStation device (including PSOne, PS2 and PS3 but excluding PSP). While the standard school computer is not surprisingly dominant over games consoles, the small percentage of teachers using these devices is notable. The 8% and 7% respectively for Nintendo DS and Wii devices is demonstrative of how effectively Nintendo has positioned itself as a provider of easy-to-use, inexpensive and child-friendly hardware. This compares to the Microsoft Xbox devices, which less than 2% of these teachers have used in school. The 8% use of Nintendo DS devices suggests that affordability and portability are emerging considerations for teachers, although the availability of more obviously 'educational' games such as Dr Kawashima's Brain Age must be also considered.

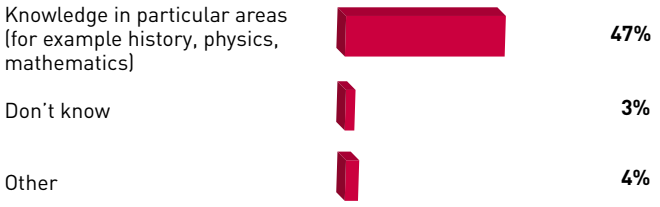
Teachers' perceptions of the value of gaming in school

60% of all teachers (63% primary; 58% secondary) would consider using entertainment games in the classroom in the future and 19% would not (the remainder were uncertain). These are significant figures, demonstrating that well over half the teaching profession is prepared to use games in school.

Of that 60%, 44% claim that would use games to develop students' motivation and engagement. 17% would consider using games in the classroom if they have clear educational value. 15% would use them because children enjoy gaming. In the interview data discussed below, it was clear that ideas such as "games motivate young people" are viewed with more subtlety than a survey permits. Indeed, for some teachers, the value of games is that they motivate students because they are a familiar part of their own experiences and these experiences are not normally valued within school. This suggests a shift in classroom power and in the organisation of teaching resources, and recognises children's own experiences as worthy of consideration in the classroom.

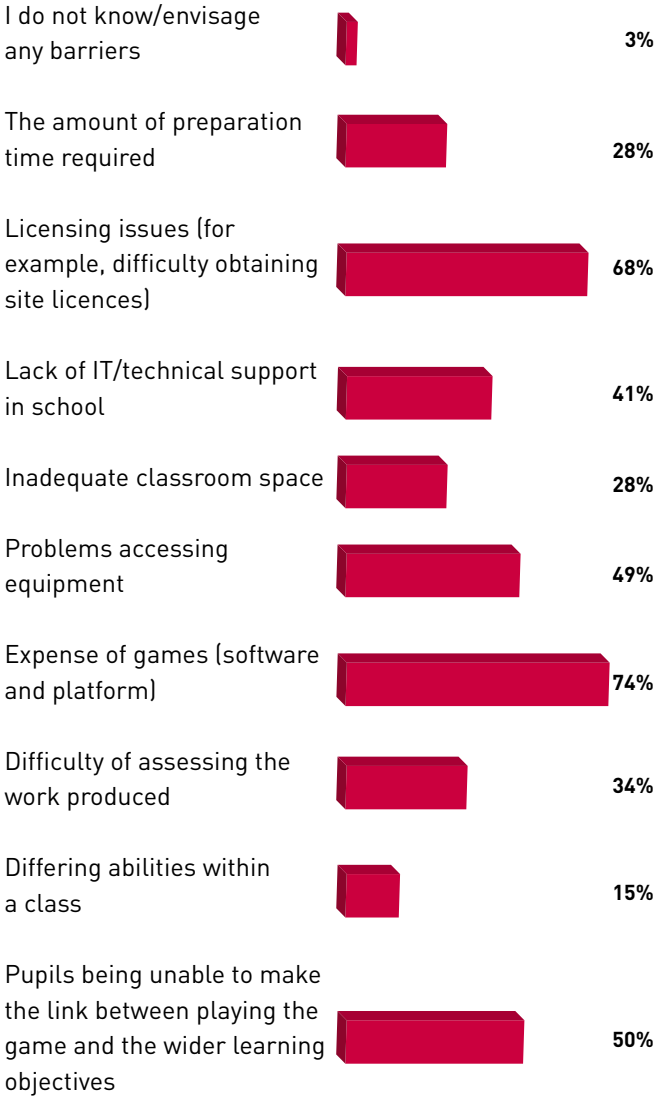
All teachers surveyed were asked what they thought were the learning outcomes to be achieved from playing computer games. The results are shown in the table below, which demonstrates how teachers perceive the benefits of games to be in enhancing motor and cognitive skills (85%), ICT skills (73%), and higher-order thinking skills (65%).

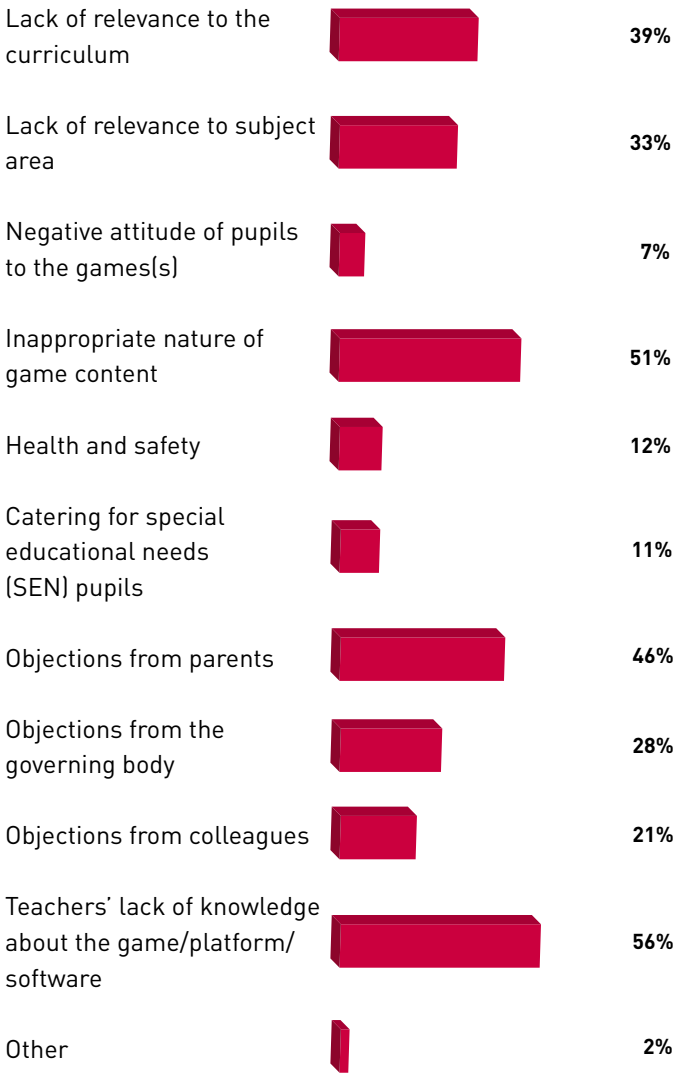




This data demonstrates that teachers have diverse perceptions of gaming as a potentially educational activity, ranging from those who wouldn't consider it at all to those who believe it is capable of enhancing young people's engagement and motivation.

The teachers also all reported on what they saw as the barriers to the use of computer games in schools, as the table shows.





Significantly, the major barriers to educational gaming according to teacher respondents were related to hardware, licensing and costs. These are logistical challenges that can prevent the use of games in classrooms and do need addressing. However, it is important to note that the logistical barriers far outweigh any other barriers teachers perceive. This suggests that if licensing, cost and hardware issues can be resolved then many more schools and teachers may begin using games in their classrooms. 56% did, though, point out that teachers' own lack of knowledge about games is a challenge.

Overall, the survey data suggests that there is a great deal of enthusiasm for the use of games in schools amongst a significant proportion of the professional workforce. While

this is encouraging, there remain persistent practical challenges that will need to be overcome for these teachers to engage in game-based activities.

It is, however, impossible with survey data to explore how teachers are using games or how they envisage using games. It may be significant, for example, that large numbers of respondents have claimed that games can benefit children's motor and cognitive skills, although only a much smaller number of teachers have actually used games in the classroom. The assumptions about the benefits of games need to be treated cautiously, in the same way that popular ideas about the educational benefits of gaming described earlier cannot be assumed to describe actual reality. The following interview findings and case studies begin to offer a range of accounts of how teachers have tried games out in schools, and what they perceive to be the outcomes and benefits.

The enthusiastic secondary school teacher

An ICT teacher at a Northern Ireland secondary school is a keen games player, favouring online multiplayer role playing games. The appeal for the teacher is the social aspect the games provide as well as the challenge of the problem solving required. Her students have varying degrees of gaming experience, with some playing a few hours each night, and others playing very infrequently only when bored. Motivations to play games include fun, competition and an opportunity to socialise with friends.

The teacher's appreciation of games outside the classroom has developed into an appreciation of their potential for education. The teacher is a strong advocate of games-based learning, and is extremely open to the integration of non-traditional applications into the formal classroom. She appreciates the numerous skills that games can encourage such as thinking skills, logical thinking, planning and team work.

This teacher also has experience with using games, such as The Sims, at a previous school, and of using games with pupils who have behavioural difficulties. The teacher felt that games were instrumental in engaging disengaged students, and resulted in improved learning outcomes, as demonstrated by the qualifications the pupils earned.

In this school the teacher is currently trying to implement games-based learning further into the curriculum, and hopes to develop a programme in which pupils will author games and subsequently review each other's work. The teacher has already used the authoring tool of Caspian Learning's Thinking Worlds in this school, as part of an extra qualification offered to sixth form pupils. Her students were positive about using games for learning.

Breadth of game-based learning activities

The sorts of games used by the 10 teachers interviewed during this study vary widely, from 'triple A' titles with high production values and major worldwide sales, to 'demo versions' of older titles freely available on the web. The following lists the games titles and/or areas of learning that were cited by teacher respondents in interviews:

2DoItYourself: Creative game production

3D Game Maker: Making and marketing games

Adventure Author: Creating game worlds as stimulus for literacy activities

Age of Empires: History curriculum

Buzz quiz game: General knowledge

Canvas: Creative design

Cooking Mama: International learning

Dance Mat: Early years number and physical health

Dr Kawashima's Brain Training: Mental maths and problem-solving

Endless Ocean: Creative writing stimulus in English

GameMaker (Nintendo DS): Making games

Guitar Hero: Cross-curricular music, design and technology and maths module

Hotel Dusk: Creative writing and narrative understanding

LittleBigPlanet: Creative production and game-making

MissionMaker: Authoring narrative games in English and media; exchanging foreign-language games with European schools

Moshi Monsters: Collaboration and team work

The Movies: Multimedia narrative creation

Myst: Creative writing stimulus

Nintendogs: Animal welfare, collaboration

Pictochat on Nintendo DS: Enquiry-based learning

PlayStation Portable: Video production and fieldwork data collection

Professor Layton and the Curious Village: Creative design

Roamer: Maths and programming

SimCity: Geography curriculum module on settlements

Spore: Science concept understanding

The Winning Game: Sports and Physical Education performance analysis

Thinking Worlds: Citizenship

Trauma Centre 2: Anatomy and biology

Tycoon games: Business Studies simulations

Nintendo Wii Sports: Fitness training and cardiovascular workouts

Wii Tennis: Design and numeracy

The breadth of game-based activity from even the small sample of teachers involved in this study is considerable. It covers the majority of curriculum subjects. However, the significance of the games used is, as most interviewed teachers agreed, entirely dependent upon the context and purpose of use.

The importance of playing games for learning

An appreciation of the social value of playing computer games for young people is widely shared by the teacher participants in the study, and for some it should be no surprise that such games can impact on the classroom. As some of the participating interviewees pointed out, playing computer games continues longer traditions of youthful play that have long been considered constructive for learners. One secondary school teacher pointed out that "when we were very young we used to go out and play in the street and play street games. And... it's no different, you learn from those, you learned how to team play... and those are all really valuable skills which are part of the revised curriculum, we're trying to teach them about self management and... games do that beautifully, and so we should use them" (secondary teacher, female).

At the same time, computer gaming is seen to be becoming increasingly pervasive throughout young people's lives, to the extent that many diverse types of activity are viewed as 'gaming' of some form or other. For example, playing on computers was seen to be an activity that "we all do, you know almost without exception". This was clarified by another teacher, who suggested that "it's going to become increasingly difficult to say 'This is a game and this is not a game'", because of the widespread convergence of technologies with one another. For example, he stated that geography teachers often use applications such as Google Earth, virtual tools which allow users to "fly around the world" and have virtual experiences normally not available in the classroom. "I think there will increasingly be that kind of blurring of the distinction between digital tools for exploring an idea or a topic or whatever or space, and game play" (secondary teacher, male).

> "I think that in some research, you know when you ask kids if they play computer games some of them will say no. But actually when you tease that out, they all do to a certain degree or other. I mean and I think quite often they perceive the computer game to be something that's done through a games console... we know for a fact that most of our children here are playing web-based computer games linked to social networking spaces and other things. It's trying to make them understand that's still a game... So they might not all be multiplayer and immersive games, but they are, I think, all to a greater or lesser extent playing computer games to a certain degree." (secondary assistant headteacher, male)

These sorts of observations are important for situating discussions about games because they draw attention to the wide range of game-like experiences that can be mobilised to support productive learning in the classroom. Clearly, 'gaming' as an educational category does not imply gaming purely for the purposes of play and pleasure. It is also important because it implies that in the minds of some educators computer games are not so different from other applications already assumed to possess inherent educational value. The comparison with Google Earth, for instance, demonstrates how a variety of virtual experiences can contribute to young people's knowledge. Games may be seen simply as alternative spaces for encountering knowledge and ideas.

The role of games enthusiasts

Enthusiasts for games and learning are important sources of inspiration for teachers, but only as long as they are able to think carefully about the practical application of games in schools. Two organisations that employ such enthusiasts are Learning Teaching Scotland and Northumberland County Council.

LTScotland established its own games and learning centre, the Consolarium, in 2006. Derek Robertson, a former maths teacher, sees his work there as establishing the wide variety of applications of games to learning objectives. To date, games activities in the Scotland region have involved schools across 30 of its authorities, and the Consolarium is seeking to ensure that the lessons learnt from each of these activities are shared as extensively as possible. For Derek Robertson, games are 'contextual hubs' around which teachers are able to create meaningful classroom tasks. This means that the role of teachers in using games in the classroom carefully and sensibly is absolutely essential. Games are not viewed as an ample resource on their own, but as resources to be 'retro-fitted' to educational objectives.

He says, "This gives the teacher the freedom and flexibility to combine curricular areas and present learning tasks via the creation of a collaborative story or a process of enquiry. The flexibility of such an approach allows the teacher to accommodate any ideas and questions that come from the children as a result of their experiences and interests arising from the learning tasks."

The Consolarium is currently working with initial teacher training institutions to ensure that teachers are skilled in using games productively in the classroom to achieve the aims of the new Curriculum for Excellence. See www.ltscotland.org.uk/ictineducation/gamesbasedlearning/index.asp.

At Northumberland County Council, Steve Bunce, a former primary school teacher, has been championing the use of games and games devices for different purposes. For example, he demonstrates to schools how to use the Pictochat feature of the Nintendo DS in enquiry-based learning, and is exploring how the popular title Spore can be used in science. Spore involves players creating ecosystems and evolving creatures. This sophisticated environment therefore allows, he believes, young people to develop their science concept understandings. He is also investigating how the Me2 Universe online game - which links a handheld accelerometer to an online world - can enhance young children's physical activity. Steve Bunce also explores the use of games technologies and software for creative production. For example, schools in the authority have used simple games authoring software such as 3D Games Maker and FPS Creator to allow students to create their own games, in the context of exploring how the games industry markets and finances products.

Teachers' knowledge of gaming

The ability of teachers to identify opportunities for game-based learning in the classroom is not always predicated on their prior experience and knowledge of playing games for their own leisure. Few of the interviewed teachers were experienced games players, instead viewing computer games as a more dominant medium in the lives of young people. One of the teachers, an assistant head at a comprehensive in Scotland where games have been tried out for a variety of educational purposes, had begun to make a considerable personal and professional commitment to gaming in order to make informed sense of its educational potential. He had personally bought a range of games platforms and software in order to assess their value for teaching staff.

> "I've never owned a games console or any of those things. And then about two and a half years ago when I first started at school I bought a Nintendo DS because I was interested in the maths training side of things. And since then it's cost me an absolute fortune because now I own a couple of Nintendo DSs, a PSP, Playstation 2, Playstation 3, Nintendo Wii and an Xbox... but I only play the games that are related to education - that's the interesting thing... or games that I think can be related to education." (secondary assistant headteacher, male)

This commitment reflects a larger challenge reported in schools concerning the sedimented attitudes of some staff towards gaming in general, but particularly towards gaming as a potentially educational activity. The challenging of staff assumptions was a concern raised

by several interviewees, who argued that teachers need to be informed about the usefulness of games, and to see evidence of their efficacy in classroom settings, as illustrated by the statement, "I think that people tend to be too afraid of games... because it's called games, they forget that it's learning" (secondary teacher, female). Another confirmed "that there's still a lack of expertise among teachers, and that that's part of the reason why a lot of teachers, even IT teachers, don't feel qualified to introduce gaming, or don't feel confident with or in the field of gaming themselves, so there would have to be quite a deal of training for teachers" (secondary headteacher, female). This perceived lack of knowledge and skill in gaming amongst teachers is confirmed by the survey data.

Teacher attitudes towards games do, of course, need to be seen in the context of wider public opinion, where computer games are often perceived to be diminishing young people's sociality, engaging them in frivolous and inconsequential activity, or even potentially endangering them. So while the majority of the teachers interviewed were inexperienced in gaming but recognised their value, one was much more circumspect, feeling that games were a "waste of time" and that their use by young people needed to be moderated and controlled very carefully.

It is clear that there is a need for professional training on the use of games in education at the initial teacher training stage, as well as through continuous professional development, to address these assumptions and existing knowledge. But there is also a requirement for teachers to try games out for themselves. This would involve a considerable 'culture shift' requiring educators to develop professional knowledge about gaming, as well as a better grasp of the mechanics of using games in the classroom.

> "I think it's important teachers accept there will be a certain amount of work involved in gaming, and there is a certain level of investment there in understanding how it works, and you're not just going to pick it up as an instant tool... I think it's like anything, you have to really know what it is to start using it effectively, you have to have investigated it yourself. It's like using a book, you've got to know what that book is before you hand out a book. If you've never read it in your life and just go 'there you go'. It's good to know if it's appropriate." (primary teacher, female)

Two of the interviewees separately stated that teachers' ability to use games in the classroom is dependent upon the availability of examples and materials from other practitioners. For one, this was imagined as an "open source ethos" of sharing where teachers interested in gaming could post lesson plans or share games-based materials freely.

The creation and sustaining of a community of teachers involved in game-based learning activities could facilitate collegial and peer-to-peer CPD. This is a model of collegiality that needs to be explored more fully, especially as the number of teachers practicing game-based learning grows. Schools interested in developing game-based learning activities will have to consider different strategies for ensuring they are suitably equipped for it, not least because, as one interviewee stated, there is also a lack of expertise in the area in teacher training institutions.

Key to achieving the necessary culture shift are teacher 'champions' able to communicate their work with others. In Scotland, this is accomplished through the Consolarium centre, a fully-funded initiative which explores and develops game-based learning alongside schools. At an individual institutional level, it is also possible for teacher champions to demonstrate the potential of gaming to their peers. One of the participating teachers saw himself in this role, carrying out the proof of concept work himself that would then convince sernior management to invest in the relevant hardware and software. One of his strategies included loaning games to groups of students to try out at home, often through playing them with their parents, in order to provide an assessment about their appropriateness in the classroom. Although the model of the lone teacher willingly funding his or her own proof-of-concept experiments is not a sustainable one, it demonstrates how the expertise and willingness of individual staff members can impact on professional culture.

The cautious secondary school teacher

A teacher interviewed at a secondary school does not play games in her spare time, and thinks they could be a waste of time, feeling that computer game playing amongst children should be closely monitored. Boys in her class, though, say they enjoy the challenge of playing games as well as appreciating the opportunity to experience scenarios otherwise unavailable to them in real life.

The school has some recent experience with games-based learning, having recently trialled a citizenship game designed specifically for the Northern Ireland Curriculum, using Caspian Learning's Thinking Worlds. The teacher felt that the source of these games (CCEA – Council for the Curriculum, Examinations, and Assessment in Northern Ireland) encouraged her to try them, as she was confident that they would be educational resources. The games were trialled with a Year 10 class, which included pupils with learning and behavioural difficulties. The teacher commented on how initial excitement from the pupils was evident; however, she also noted how after a few weeks of playing the games, boredom was also evident once the pupils were very familiar with the content.

The teacher has highlighted how games can address certain changes being implemented within the new ICT curriculum, with gaming technology addressing and facilitating some new curricular objectives, such as the role of exhibiting work, exploring and expressing ideas. Plus, she foresees that teachers working with the new curriculum will go beyond the use of multimedia and will soon extend to the development of websites and games.

She warns, however, that there is a lack of experience, expertise and confidence amongst teachers with regards to gaming technology, highlighting how ongoing training is required for teachers implementing game-based learning.

Young people's motivation and engagement

While most teachers admitted their lack of knowledge about gaming generally, or even described themselves as "quickly bored" by playing games, they all appreciated that gaming is an important aspect of young people's lives. One, a media studies specialist but not a games player personally, went so far as to state that children ought to be playing games at least a little, just as they ought to be watching some television. Both, he claimed, are a "window on to the culture". This statement recognises that computer games are significant cultural forms that are influential in modern youth experiences.

Recognising computer games as cultural forms associated with social practices makes the question of students' motivation to use computer games in education more important. The assumption that games should be used in classrooms simply because they motivate and engage young people in ways that other teaching methods do not was treated with caution by teacher interviewees. One stated that "the biggest thing is motivation really, because it's relevant to them, it's a big part of their lives, it's what they relate to" (primary teacher, female), while another said, "I've got this idea that sometimes teachers use computer games in class because it's a fun activity and it keeps the kids engaged" (secondary teacher, male).

This pair of statements shows how teachers consider gaming to be a powerful influence on young people's lives, which at times seems as if it overshadows school and traditional learning methods. What both also identified, however, is that engagement and relevance are not simply to do with making learning 'fun'. In supporting young people to see their own experiences of any cultural activity as relevant within the formal setting of school, teachers are involved in making decisions about what is and is not worthwhile studying in school. It helps assure young people that their own cultures are recognised and taken seriously by the institutions that are supposed to support their development.

Indeed, it is recognised that not all children and young people are equally motivated by the same things, including games, as one interviewee made clear: "We've got motivated kids and we take them off-site, but we all need different motivations and stimulation and it just adds to the overall experience in the curriculum they're getting" (secondary teacher, female).

Motivation and engagement are terms often used about game-based learning which present gaming as the dynamic alternative to a calcified curriculum. These teachers, however, realised that students' motivation and engagement are part of a more complex situation, where schools are increasingly having to confront the reality of young people's popular culture experiences. This is partly to do with widening the curricular experience to include games playing. It is also concerned with ensuring that young people receive an education in which they can see the contribution that computer games and other media make to popular culture.

In order to develop a set of cogent messages about the benefits of gaming in schools, it is essential to take a more sophisticated view of motivation, engagement and relevance than an instrumental one where games are viewed as providing the 'fun' incentive for young people to pay attention in lessons. Seeing games as relevant in the curriculum as well as relevant to young people's lives demonstrates that their experiences, interests and ideas are worthy of consideration in the curriculum.

'Dance Maths' in the infant classroom

A class of first year primary school students have been using a dance mat for learning maths. School pupils commented that when they were able to move around, they felt this helped them learn as they weren't sitting at a desk. The task involves children counting dance steps in time to the music and rhythms. As the dance mat activity is to be played one at a time, a small group gathers around the dance mat and screen while each pupil takes it in turn to dance. The pupils not dancing still try to practise the moves and count off the mat. But they have also been involved in taking turns and encouraging fellow pupils to score well.

The teacher reminisced about the first time using the dance mat. When the pupils were told to use it, they immediately took to the mat naturally. The teacher then allowed the pupils to play the game and encourage counting the steps. On returning to the pupils, the teacher then noticed that they had been taking a note of each score on a post it note and forming a league table on the wall, with highest scores at the top and moving the scores around when new scores came into play. Scores were reaching up to 40. The teacher had not set up the league table, this was a combined decision by the class of 4 and 5 year-olds.

Gaming and the curriculum

Although student motivation is clearly a factor in teachers' own motivations for bringing game-based learning into the classroom, it is absolutely clear that this does not imply teachers giving up their professional responsibilities simply to keep young people happy. Games were described by some as "teaching tools" or resources that can be used productively to ramify specific educational goals and outcomes.

> "I think that gaming... is a teaching tool, it's a starting point, it's not letting them come in and play games, it's 'let's discuss it, what skills are we getting from this? Even the fact we're assessing what's going wrong here? Why aren't we getting better? Oh it's because we're too noisy in the classroom. OK, that's been a learning experience; we've evaluated how we've done it.' So I think they all generate new learning opportunities, and I see it contextually, more than anything else." (primary teacher, female)

Viewing games as 'teaching tools' is a useful distinction because it highlights the key role that teachers play in defining the purposes for their classroom use, in planning activities, and in providing curricular context. Games are, in this sense, used as part of planned learning experiences rather than for their own sake or for flimsily conceived incentivisation purposes.

Teachers also identified how space is opening up within the curriculum to make the use of games more practicable. In English, for example, games can be used for focusing on different narrative structures. More broadly, increased flexibility in curriculum management (cited particularly in relation to the new Scottish Curriculum for Excellence system) makes it more possible for schools to organise activities to accommodate gaming. One idea was to offer 'opt-in' learning units for students where aspects of gaming were to be included. This idea was felt to address, at least to some extent, the fact that not all young people are either interested in computer games or much skilled in playing them.

Another reason given for locating computer games within the entire curriculum experience was that they are a part of young people's wider 'textual' ecologies, as much a resource for leisure or learning as reference books, television, the sciences, and the arts.

In terms of the school subjects, teachers talked about the applicability of specific titles to specific goals. Two mentioned using SimCity for units in geography, specifically in work on settlements. Another had used Age of Empires in history teaching, and the Brain Training games available on the Nintendo DS platform were being used extensively in Scottish schools as part of a major research programme in maths education at primary school level. Interestingly, sports games available on platforms such as the Nintendo Wii or dancing games played on a floor mat attached to a console were being used to supplement physical education, while several games from the Tycoon series (such as Rollercoaster Tycoon) were used in business studies[58].

It is notable, however, that in the majority of the interviews the teachers talked about using games in a more cross-curricular manner, especially in the primary school setting. Games such Wii Tennis were therefore being used to support geography, literacy, and design and technology at the same time. In many cases, the games simply became the context or backdrop against which teachers were designing and presenting to children a range of diverse activities. This meant that the 'gaming' aspect of the activity itself was a less dominant feature of classroom activity. Gaming was viewed as a launch pad for linking together a range of curricular areas and objectives.

Endless Ocean in the primary school

Endless Ocean is a game designed to be played on the Nintendo Wii which involves becoming a diver and exploring life beneath the sea. The game has been designed for entertainment but involves educational content such as learning about the species and coral under the sea and understanding diving and physics, such as obtaining the right buoyancy.

Teachers have been implementing Endless Ocean into the primary school classroom to cover a number of areas of the curriculum. The way in which it has been used is for pupils to 'buddy up' in pairs and take it in turns to have some time per week diving and exploring the sea. The teacher then wraps this experience into a number of areas covering topics such as English and literacy, science, biology, physics and art and design. Every activity performed using the game is carefully mapped onto objectives from the primary school curriculum.

The way in which the game is implemented into the classroom is for each pair of divers to explore the sea and keep a dive log. The dive log maintains a record of all the types of fish they find. After exploring, the pupils carry out research to find out more about the fish: what they ae called, where they live, what they eat, and what can eat them.

Pupils explore and look for treasure and the mysterious shark, which is the most difficult species to find (but it has been done as the pupils stated). The log book also acts as a point for the pupils to write about their experience and to be a catalyst for creative writing. One pupil, who didn't like to write stories and felt he couldn't, ended up writing 10 pages about his experience in Endless Ocean.

The teacher has linked the activity to art and design where the pupils create papier-mâché fish and coral, and various decorations for the classroom, to link the virtual experience with physical and tactile experiences. They have merged their art, design and graphics skills alongside storytelling, to create a fish in Crazy Talk (an application used to make talking avatars) and let their fish talk about the dive experience.

The teacher has wrapped up the project by including a debate session to allow for the development of negotiation and communication skills. This has involved splitting the class into two groups; one an environmental group protecting the environment and surrounding area, and the other a tourism organisation seeking planning permission to build a hotel and tourist area on the sea front.

[58] A brief research report on the health benefits of playing the Nintendo Wii sports games in educational settings is available at: www.acefitness.org/getfit/studies/WiiStudy.pdf.

Skills and confidence

Games may have a role as tools to support the curriculum, but teachers also see gaming as possessing benefits that transcend the limits of subjects. These benefits were conceived in terms of skills and confidence-building.

> "I think there's a lot of skills to be gained from game playing. There's a lot of logical thinking, there's a lot of planning, and generally there's a lot of team work. And those are all skills that I'm trying to teach the whole time anyway, and I think that your learning should come from where the pupils are, and games is where they are." (secondary teacher, female)

Skills development was especially prevalent in discussions with teachers, several of whom saw gaming as key to enhancing young people's technological and new media proficiency. These skills were conceived very much along the lines of 'constructionist' learning and '21st century skills', where technological fluency, reasoning, planning and collaboration are seen to be essential for young people growing up today. As one put it, "I think that our job is to have them learning and using the skills of their world that's around them, and that's gaming, that's interacting with technology" (primary teacher, female).

The skills of successful gaming were seen as not only developing competence within the game itself but enhancing a range of other skills, including web research, and persistence in solving challenging problems. One secondary school teacher articulated the benefits of gaming in terms of 'redrafting', an idea that resonates with the notion that games are perfect environments for practising skills in an authentic and engaging fashion. What she also showed was that gaming is part of a wider set of practices which involves the internet and peer groups. It includes searching for 'cheats' and 'walkthrough guides' on the web, as well as exchanging immaterial advice with friends through conversation.

> "...there's a lot of benefits. I mean just when they're straightforward playing they're learning a lot of logic – they're having to plan. Particularly games that involve them having to beat levels – they often have to go over and over. Redrafting, we ask for all the time, and they do that without anybody asking them to. If they really get stuck they go and research on the internet to find the walkthrough that will help them get past the level. Those are the skills I want for my pupils. I mean every teacher's asking them to do that, and so they're learning a lot and I think it's very beneficial to them... We're finding at school that any time we have introduced anything innovative in IT it has been swallowed up by the pupils so quickly and they generally end up much better at it than I am... and so quickly. You know it's amazing, and they will devote hours and hours of time to learning skills. I want them to learn these skills that are involved in game playing and in game authoring, and they're learning them without me asking them to. So as soon as I have introduced a topic and sort of let them run with it, they have... and we have had very fabulous skilled results coming out of that. So I think it's two really big successful aims at the end of it – one is that they're engaged, they want to learn. And second, that what they're learning is good and useful." (secondary teacher, female)

These teachers saw gaming as an integrated practice within a wider media ecology where skills are increasingly transferable from one application to another. Indeed, in an environment where technologies are increasingly convergent with one another - so that games consoles can also be used to browse the web, mobile phones can be used as cameras and MP3 players, and handheld games devices used as video cameras - it is also possible to see convergence as a key human attribute. This means viewing ourselves as convergent in the sense that information processing, communication, gaming and creative production increasingly involve an interrelated set of skills and competences.

The methods that young people employ in their gaming are seen by some staff, then, as essential skills for learning. And for some students, teachers suggested, their skills as games enthusiasts had been put to good advantage in the classroom with the result that their confidence had been boosted. In one example, students with a good technical grasp of gaming had provided support and assistance to their peers while creating games content using Adventure Author in a primary school. This led to social interactions that might not have occurred without the application, because it put these students in a position of confidence and authority, whose expertise was valued by the teacher and put to productive

use for the good of the whole class. For one specific young boy, she stated, this had revealed a set of skills that had previously been invisible to teachers.

Nintendogs in the junior school

Nintendogs has been used in a Primary 4 class (age 7 and 8), where pupils work together in teams of three. A DS is used by each small team, and each team has one person who already owns a DS and has previously played Nintendogs. The teams have decided to call the person with Nintendogs experience the 'Top Dog'.

The teams have to care for the dog and ensure its welfare is maintained. As well as focusing on welfare, the pupils work together, take turns in taking the dog home and making decisions about how to best look after their virtual pet.

The teacher has had one complaint from parents about one of the teams. The parents came into the school to highlight that the virtual pet had not been well and was not receiving the proper care it needed to be a healthy and happy virtual pet. The teacher used this experience to show pupils the importance of team work in order to keep the dog healthy and happy.

Relationships and social interactions

Computer games are often considered a cause of intensified social isolation. Teachers involved in the study disputed this perception of games in young people's lives, as well as in school. Gaming is, in fact, seen to be an intensely social experience for many young people. Games can be social not only in the sense of maintaining friendship networks but also as a way of creating and sustaining bonds. This, too, is not simply restricted to virtual interactions but occurs when children and young people have conversations about computer games, exchange hints and tips with one another for better progressing in specific titles, and exchange material artefacts such as games magazines, walkthrough guides and cheat codes.

> "I would certainly challenge any idea that computer games are intrinsically non-social, because it seems to me that not just multiplayer games, but the way that kids get together around computers and play games, and the way they talk about games and share experiences is very pro-social and very socialising, and is probably for some children who would otherwise find it difficult to, to sort of establish strong social relationships and so on, can be quite a powerful thing." (secondary teacher, male)

The social nature of gaming amongst young people also, according to the interviewees, lent itself to constructive collaboration techniques and low-risk competition. One staff member argued that "because so many computer games now are immersive and Wi-Fi and multiplayer", young people have become much more "used to collaborating" and more used to both winning and, crucially, to losing in a safe environment: "Whereas in a classroom situation they're not used to losing - they feel embarrassed by it. It's a funny thing. So I think there's all kinds of interesting benefits that probably would be really interesting to tease out in the research in terms of relationships" (secondary teacher, male).

The potential of computer gaming to support the development of relationships within the school setting was discussed extensively by one interviewee, who saw relationship-building as perhaps the most valuable outcome of game-based educational activity. He viewed gaming as intensely pro-social in ways that normal classroom routines are often not, with the consequence that it has the potential to enhance relationships between students, as well as between students and their teachers. This aspect of game-based learning is underexplored and would warrant further interrogation. Indeed, the enhancement of teacher-student relationships is increasingly cited in educational research as an urgent priority, and even in policy there is more emphasis on teachers and students working together as 'partners in learning'.

> "The first one is relationships. For me that's the most important thing, because the majority of my day job is spent dealing with relationships between pupils and staff, or relationships between pupils and pupils. And I think that using computer games could be a really really good way to develop relationships between pupils and staff. And if you like the whole of our Guitar Hero project was designed about relationships and social interaction... the relationship between a classroom teacher and a group of students is incredibly powerful.

> And also then the relationships between other students as well as they help each other, as they collaborate... because they don't feel threatened... they don't feel threatened by computer games." (secondary assistant headteacher, male)

At the same time, one of the teachers recognised that it can feel professionally threatening to admit that students have more expertise in media than they personally have. This is centrally a concern over power in the classroom, and about the levels of expertise that teachers feel they should possess over the assumed level of students' expertise. When it comes to games, it is often the case that certain students know more than their teachers. Although this could be threatening, it could also be empowering: "I mean we've had some people that have been reluctant to start with because they don't see the point. But the reality of it is, is once they get started and once they're prepared to give the ownership to the kids, then the whole thing takes care... I think the whole thing takes care of itself" (secondary teacher, male).

From a policy perspective, relationships between schools and parents are also important. Parental engagement has been the focus of two of the participating schools, and is seen as essential to ensuring the sustainability of game-based learning. One primary school has actively been engaging parents by holding sessions where the pupils present on how they have been using games in the class. This is an attempt to help parents better understand that the games played by children can be educational, and how they can harness this positive game play in their children's learning experience. Another secondary school has approached parental engagement through showcase events and personal contact with parents; at one such evening showcase event, 250 parents turned up, exceeding attendance for some other events. This demonstrates how the use of games in schools galvanises interest; a more focused exploration of parents' attitudes towards educational gaming would provide useful evidence to understand this more fully.

One reason that games highlight the importance of relationships is that games are seen to 'belong' in the youth domain; as such, young people feel greater 'ownership' and perhaps possess greater expertise in this area than teachers. This would certainly seem to be borne out by the data which shows teachers have little personal experience of gaming themselves, whilst simultaneously seeing games as part of the bedrock for young people's experiences today. The concern with parental engagement is related to public perceptions about what actually constitutes valid and valuable educational activity, and is similarly related to popular perceptions of gaming as a purely pleasurable pastime rather than a challenging complex of social activities and skills.

> "I think the other thing is to talk about appropriateness is trying to get parents on board as well. I think that's a really really important thing. If you take the Guitar Hero project then Guitar Hero has got a rating of 12. Now a lot of the kids that are playing it are 11, so we were very very careful about how we did that, and I wrote on behalf the primary schools to all of the parents in their class to explain about the game and explain that the reason it was 12 was because some of the lyrics in the songs... and the songs that we deemed to be in appropriate you know we wouldn't use. And that's why we're also very very keen that we had the big showcase event last year where we invited parents in the community, to sort of show them that it is about learning, it's not just about playing... you know it's really either the context or the value of that piece of software." (secondary assistant headteacher, male)

Such concerns are bound up in a host of questions about power structures and relationships in the classroom. To cede greater ownership of the learning experience to young people means challenging the traditional hierarchical arrangement of the classroom, as well as democratising the learning experience to ensure young people's experiences, knowledge and expertise are represented by the curriculum itself.

The emergence of relationships and social interaction as a key finding from the interviews is interesting since the survey data on what teachers consider to be the benefits of gaming suggests most teachers do not think of gaming as especially social or collaborative. This would seem to indicate that common perceptions about gaming in the teaching profession are more focused on skills, while teachers with actual experience using games have slightly different ways of thinking about their benefits.

Guitar Hero during transition

The Primary 7 class have been using Guitar Hero for transition up to the high school. The game is used to allow pupils to have a familiar connection with the high school, and to help teachers from the upper primary and lower secondary work together to improve the transition process.

Guitar Hero has been used in a number of ways to cover the curriculum. Pupils each create a group to form a rock band and come up with a name, logo and image for the band. The band has to plan a tour, tour dates and locations, and work out the breakdown of finances they would need.

The band then has to create a poster for their tour and start to negotiate a contract with a music producer. And of course they need some good songs for the tour, so song writing is a part of the project, using the electronic music package GarageBand.

The pupils also visit the science labs at the high school to learn about music and sound. This is carried out with the secondary first year class, to help the pupils meet current high school classes and work with them on a common project they both understand. The primary school pupils said it was a great experience as it made them feel more comfortable with their move up to the high school.

Media literacy

A democratisation of the curriculum assumes that one of the tasks for schools and teachers is to ensure that young people learn about and are able to understand the world they are growing up in; it implies taking students' experiences as the starting point for learning, as worthy of consideration in the classroom. Media literacy educators and researchers assume that this is a necessary first step in getting to grips with how young people experience and perceive an increasingly influential media industry. As an extremely popular cultural form, games and gaming need to be situated in learners' own contexts.

> "It's appropriate because it's an important medium and it's an important element in children's literacy, from their cultural literacy, and through being able to actually make games, their creative literacy. So really our rationale for it, the drive behind it is about literacy really. And you know that's something that we would argue strongly for, quite a broad notion of literacy which incorporates all sorts of different kinds of textual forms and would include, you know, quite a lot of emphasis on popular media and forms. And so it's absolutely natural for us to be working with games and television and film and Shakespeare and science textbooks, you know it's all part of children's engagement with text I suppose. So it's quite a sort of media-y angle, rather than a kind of how do we use games to learn about other things." (secondary teacher, male)

This kind of approach to media literacy focuses on how children and young people read, evaluate and create media texts, and is based on their own existing media experiences. It concentrates on the idea that while young people develop cultural knowledge through accessing texts such as novels, science texts and other texts valued in the curriculum, they also need to have available a range of critical strategies for interpreting the role of media in their own lives and in the culture.

In these regards, media literacy around games also concerns parents, games developers and regulators. Therefore, it is considered by teachers to be the job of schools to develop children's ability to think critically and discursively; the job of parents to decide on access to content, limits and control; the job of games developers to consider who they are selling things to and why; and the job of regulators to make sure that research on children's use of media is acted on in relation to certification and the provision of guidance.

The main strategy for media literacy education through games involves the creation of games media; it is through making games of their own that young people are supported to query the mechanics of the medium itself, to explore its messages and its origins, and to consider the ways in which games media influence audiences and players. The idea, as a media specialist teacher put it, is that discussion and theory is interlaced with working with the software in order to illuminate and bring out ideas which can then be made explicit through discussion. This statement about media literacy is very important because it identifies how teaching is concerned with 'theory'. Media literacy education seeks to provide a theory of how media operates in contemporary culture, and to organise activities in such a way that young people incrementally develop their sophistication as critical and evaluative thinkers through participating in the practices of media production and media interpretation.

Media literacy, then, has an overtly theoretical and political orientation, concerned as it is with supporting young people to ask questions about the role of media in influencing the public, and in engaging them in processes of creative production and cultural criticism.

Making games with MissionMaker

MissionMaker is a software application for students to create their own computer games. At a secondary school in the east Midlands, an English and media specialist teacher uses MissionMaker to reinforce and extend students' media literacy skills, as well as to engage them in literature.

In one English module, students have been set the task of creating computer games that dramatise key scenes and plot developments in 'Romeo and Juliet'. Since the play features many instances of characters being opposed, as well as moments of violence, the teacher feels it lends itself well to computer game adaptation.

The purpose is to engage with the content of 'Romeo and Juliet', but moreover to focus students on narrative structures, and the importance of narrative in texts of various kinds, from Shakespeare to computer games. It is also intended to support students' broad literacy skills, where literacy is conceived as having cultural knowledge, critical capacities and creative production abilities.

The teacher has also created his own MissionMaker games to help introduce students to poems, by illustrating classic poetry through moments of game play, and is keen for a forum where he and other like-minded teachers can share ideas and materials for game-based activities.

Safety and risks

Protecting young people from risks and harm while engaging with media of any kind is a key priority for teachers. The strategies employed by the staff participating in the study tended not to favour an over-emphasis on protection, however, so much as education in order to allow young people to make informed and sensible choices on their own behalf. One teacher expressed concern that young people's experiences in a media-saturated environment could actually limit their access to a wider range of interactions. She said, "I do have a concern that as so much is done on a computer they do have to be given other opportunities to interact physically and socially, I think that's a concern after having spent a week with a couple of teenagers recently, and they spent the entire weekend on MSN and they just do not interact with anybody else around them, and it's not that they're not able to, and it's not that they're not nice people, they are, but you think we're losing something here" (primary teacher, female).

On the whole, teachers thought that there is a greater need for joined-up attempts by schools and parents to ensure that sensible messages about online safety and games literacy are communicated together. The message was expressed in terms of supporting children to become effective self-managers and decision-makers, aptly informed about the panoply of media choices available to them, but discerning about what decisions to make in terms of accessing content, engaging in mediated communication, and so on.

> "I think ultimately for kids, their parents have a responsibility to be aware of, or to control the material they come into contact with, of any genre, of any description. So I think there is a big responsibility there. I think us as teachers, and in other areas, you're keeping yourself safe, you're dealing with internet safety, you're dealing with safety out and about. I think it's important that we acknowledge this is a part of... in the same way we are with internet safety, and chat rooms etc, that we're addressing the issues that are coming up, and we're approaching that and informing them to make the right choices, and I always encourage debates and discussions and things and I think that, you know, what are the rights and wrongs here, what comes up out of this and so I think it's important to do that sort of thing." (primary teacher, female)

From a policy perspective, the Byron Review has demonstrated a heightened need for strategies to support children's online safety. Strategies which support young people to become evaluative and interpretive about media, including computer games, alongside strategies to heighten public awareness about media risks, need to be sensitive to the fact that an overly punitive and hierarchical approach which foists existing adult values onto a youth culture that many adults inadequately understand, is likely to stultify and restrict opportunities for young people to make constructive use of media or to make up their own minds about it.

Straightforward restriction of media opportunity will not allow young people to learn the necessary skills of being discriminating media users and producers, as one of the participating teachers demonstrated, because "they often talk quite subversively about these things as well. You know they have little tricks and games that they can play with it that kind of transgress the true intention... which is something children always do with everything really. You know they'll kind of impose their own humour and their own little sort of peer jokes on these very structured kind of top-down things" (secondary teacher, male).

Young people's subversive tendencies, alongside the sophistication many of them possess in relation to games, should be welcomed into public debate about the role of schools in providing an education suited to the contemporary media ecology.

Conclusions

The major influential ideas in games and learning are that games are persuasive, constructionist, ideally suited to situated and authentic skills practise, and an entry point for media literacy. Aspects of all of these theories of games and learning are evident in the data.

However, the reality of game-based learning practice is that teachers are taking a much more pragmatic approach, concentrating on local, social and interpersonal concerns instead of grand, all-encompassing theories. While some teachers have articulated their work along the lines of enhancing '21st century skills', and the survey suggests that teachers view games as potentially enhancing children's cognitive and higher-order thinking skills, there are also more real concerns for other staff about relating their teaching to children's everyday lives, about engaging parents, about enhancing social interactions in the classroom. Twinned with this, there is other data to suggest that many young people do not automatically see the skills associated with playing computer games as being useful real-world skills development.

Perhaps the most significant finding from this piece of research is to do with relationships. Since classroom relationships between adults and children are increasingly seen as important to educational progress, the finding that teachers are experiencing gaming as a practice which enhances these relationships needs to be explored more fully. From an analytical perspective, classroom relationships are organised to distribute power more or less equally between participants. In conventional classroom routines, that power is retained by the teacher, but with game-based learning, some young people are able to exert their own authority because of their levels of expertise. The question to pursue more rigorously concerns the extent to which these emerging examples of young people as active participants in classroom organisation can form the basis for a larger programme of work on learning interactions. What skills, for example, can young games players bring to the classroom that can be more systematically examined and understood, in order to develop strategies that make the most of their expertise? How could such strategies be more widely communicated to other educators?

Parental engagement, too, is an important finding. This study had no scope to engage with parents or to gather data about their attitudes towards game-based learning. Clearly this is an area for further investigation. From the available data, it is clear that parents of children at the participating schools take an active interest in games, as demonstrated by their participation in events. These kinds of engagement activities by schools are important in supporting parents to understand both how classroom activities are being modernised to take account of new technologies and social practices, and to understand and value the breadth and depth of their children's virtual experiences and skills in the gaming world.

Media literacy remains a major theme in much of what the teachers have described. Even in their discussions of why games are relevant to schooling, there is an awareness that educators need to connect more forcefully with the kinds of new media worlds young people experience outside school. This is not simply to lubricate the learning experience by making it more appealing to young people, but to help students to be able to better interpret a technologically-enhanced present, and to make informed choices on their own behalf as they move into an increasingly media-saturated future.

E-safety is an important consideration, and many of the teachers have articulated their thoughts on this in ways that are commensurate with a broad media literacy approach. Protection is not seen to be adequate; instead, young people need to be educated and informed about safety and risks in gaming. Engaging parents and the public in sensible debate about the role of gaming in young people's lives will help to establish media literacy as a proactive, rather than a reactive or even reactionary, mode for approaching child safety and informed risk-taking.

In terms of the kinds of educational content or themes that have emerged from the research, it seems clear that gaming does not fit naturally into any single subject area. While there is emerging evidence of teachers using games such as Hotel Dusk to stimulate children's literacy - by incentivising them to write their own crime noir narratives - in the majority of cases, the interviewed teachers had used games in a much more cross-

curricular way. One teacher, for example, had used Wii tennis in a primary school classroom to teach literacy (through children writing tennis tour diaries), design and technology (through designing racquets), and geography (planning a tour of the grand slam nations).

Teachers interviewed for the project, then, are not generally using games because any single title in itself seems to offer up its own educational benefits. Instead, games are being used as useful resources to support wider educational goals and outcomes. This does not mean that teachers are making restricted use of these titles: it means they are recontextualising them to demonstrate to children how they can be used to enhance formal school learning. Games are being used both as resources to support educational classroom activities, and as contexts for other activities.

These points indicate how game-based learning in the classroom is more dependent on teachers' pragmatic considerations than on grand theories of games as an educational medium. Although the 'big ideas' described earlier are useful theoretical tools for establishing the importance of games for learning, they are less useful for teachers for whom considerations such as classroom interactions, student confidence and parental engagement are prevalent.

With the exception of media literacy texts, this is probably because much of the available literature on games and learning focuses on what happens outside school rather than on what happens with games inside school. Some of this literature is motivated by a complete resignation with schools, as if schools are a lost cause, and the assumption that while teachers are limited to delivering packet-sized content to largely unwilling students, in their leisure time those same young people are involved in sophisticated, skilled and enterprising game-based activities.

In the context of the UK, particularly at a time when the curriculum is being loosened to allow more local flexibility in England, Wales, Scotland and Northern Ireland, there remains a much firmer commitment amongst the interviewed teachers to schools as an important site for young people's intellectual, social and practical development. If computer games can contribute to addressing the urgent concerns of today's educators, and if support can be provided for the profession, then games will be increasingly recognised and used as tools for teaching, though it is important for educators to remain critical and evaluative about their usefulness and implications.

Finally, many of the emerging examples of game-based learning come from enthusiastic, gifted teachers who are applying the use of games to genuine educational aims. In that sense, an inclusive and useful way of describing game-based learning in schools is **the use of games as resources to support the educational aims, objectives and planned outcomes of teachers who understand that games are an important medium in contemporary culture and young people's experiences**. This statement recognises that computer games are always used by people interacting with media in a social setting and a cultural climate. It questions the assumption that games are in and of themselves useful tools for schools, and re-establishes the central importance of teacher professionalism.

Recommendations

These recommendations are aimed at provoking a system-wide approach to gaming in education. As such, they are recommendations primarily for policy rather than for classroom practice.

Definitions of games and learning

A core set of strong messages should be devised across the education system in relation to computer games and their place in formal education. It is suggested that these messages could include:

1. Computer games are an important medium in modern culture, including in young people's leisure activities and their social relationships.

- Educational institutions have a duty to ensure that young people understand and can evaluate games as an influential and sometimes controversial media form.
- Games should be seen as having cultural significance like literature, science concepts, music, television, the press and so on: they all affect the way people live their lives and make sense of their experiences.
- Games should be viewed in the context of increased commercialisation in young people's lives, and young people should be supported to be evaluative and critical about how commercial interests operate in modern culture.

2. Computer games can be used in the classroom to support defined educational objectives.

- Games are useful resources that can be studied in terms of their significance in modern culture, in terms of their technological components, in terms of their art and design, and in terms of their narrative structures and rule systems.
- Computer games can be used in many different curricular areas to support, complement and reinforce specific curricular or disciplinary concepts.
- Games can be the contextual basis for cross-curricular activities, with teachers making constructive use of games technologies alongside other activities.

3. Computer games are more than 'just for fun'.

- While computer games have a rightful place in many people's own leisure contexts, in the educational context they should not be seen only as an incentive for young people to engage in learning.
- Computer gaming should be seen as a cultural activity amongst many young people, which educators should seek to appreciate and understand, and seek to connect to young people's intellectual and social development.

Teacher training

In order for teachers to make best use of games and games technologies in the classroom, there is a need for training provision both at the initial teacher training (ITT) and continuous professional development (CPD) stages. Such training should involve demonstrating to teachers how games can be used resources, as well as exploring the implications of games as cultural forms in young people's lives. This means understanding how to use games, as well as how to study and understand the significance of games in society. The Training and Development Agency (TDA) could consider how training for game-based learning can be provided during ITT and CPD. In particular, there is an opportunity to include game-based learning components in the proposed Masters in Teaching and Learning for teaching staff.

Costing and licensing

The high price and lack of licensing agreements for games prohibits many schools from using these resources. The games industry could be incentivised by the Department for Business, Enterprise and Regulatory Reform to offer licensing agreements to schools on games titles where educational benefit has been identified by trial school sites.

Games champions

Games champions are important sources of inspiration and ideas for teachers. In some cases, such champions are employed by government and work across many authorities, such as through the Consolarium and Learning Teaching Scotland; in other cases, they are local authority employed consultants who work closely with schools in their authority. In a number of individual school settings, too, champion teachers are introducing their own colleagues to games and gaming. A series of incentives for potential teacher champions should be explored, for example, by the TDA.

Gaming in the curriculum

The main authorities with responsibility for the curriculum should consider the range of ways in which computer games may be used as resources to support curricular aims. For example, 'media literacy' schemes should be established across the curriculum to ensure children and young people are able to appreciate and interpret contemporary media, including games, and their impact on specific curriculum areas. Ofcom should consider developing additional guidance on 'games media literacy' aimed at school teachers. In addition, subject associations should be involved in dialogue about the place of games within subject areas.

Child safety

The UK Council for Child Internet Safety sub-group on gaming established to address the Byron Review should be provided with access to available data and case studies which demonstrate the effects of games on children and young people in educational settings. This group should focus on providing guidance to government and for parents on the productive uses of games in a variety of contexts and for a variety of purposes in schools.

Dissemination

Examples of innovative practice with games in schools need to be shared across the workforce to ensure that teachers are aware of the opportunities associated with game-based learning. The QCA should consider developing web pages where specific examples of game-based learning can be shared, with links made, where possible, to subjects and to the new cross-curricular theme areas.

Public engagement

Computer games continue to generate public outcries and 'media panics'. Government could consider a public campaign to develop a more productive appreciation of the gaming activities of young people. Schools that have engaged with parents around gaming have shown how assumptions and prejudices can be challenged.

Useful links

www.engagelearning.eu - European Network for Growing Activity in Game-based learning in Education

education.qld.gov.au/smartclassrooms/strategy/dp/games.html - resources and advice for educational gaming from Queensland, Australia

ltsblogs.org.uk/consolarium - blog from the Scottish Consolarium games and learning centre

www.ltscotland.org.uk/ictineducation/gamesbasedlearning - Learning Teaching Scotland game-based learning website

www.gamebasedlearning.org.uk - game-based learning site

www.newsgaming.com - Newsgaming website dedicated to games designed for social purposes

epistemicgames.org/eg - site on gaming as an introduction to professional skills

www.educationarcade.org/gtt/home.html - MIT/Microsoft partnership creating prototype educational games

www.persuasivegames.com - gaming for purposes other than entertainment

www.gameslearningsociety.org/research.php - educational gaming research site

About Futurelab

Futurelab is passionate about transforming the way people learn. Tapping into the huge potential offered by digital and other technologies, we are developing innovative learning resources and practices that support new approaches to education for the 21st century.

Working in partnership with industry, policy and practice, Futurelab:

- incubates new ideas, taking them from the lab to the classroom
- offers hard evidence and practical advice to support the design and use of innovative learning tools
- communicates the latest thinking and practice in educational ICT
- provides the space for experimentation and the exchange of ideas between the creative, technology and education sectors.

A not-for-profit organisation, Futurelab is committed to sharing the lessons learnt from our research and development in order to inform positive change to educational policy and practice.

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