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The convergence of gaming practices with other media forms: what potential for learning? A review of the literature

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Abstract

Nowhere in the current digital technology landscape is the process of 'blurring the lines between media' more apparent than with the uses and applications of gaming practices and technologies. Here the overlaps between new media and media interfaces are becoming significant as games technologies and practices are becoming more pervasive as commonplace social practices. This paper reviews literature for evidence of these trends of convergent media forms as a starting point for a wider debate for using games technologies and practices to support learning practices. The paper outlines convergences between gaming and cinema, gaming and the Internet, and gaming and emergent technologies and interfaces (e.g., mobile phones and social software). The paper aims to foreground major dimensions of convergence in relation to the potential of innovations in educational practice and activities. The paper concludes that variant forms of gaming are widespread. But while the converging forms of gaming with other media forms provides potential for supporting educational practices these new forms still need to be considered in relation to clear pedagogic strategies, supported peer interactions and tutor engagement.

1.0: Introduction: Discussion of current state of gaming. The convergence between gaming and other media forms

Nowhere in the current digital technology landscape is the process of ‘blurring the lines between media’ more apparent than with the uses and applications of gaming practices and technologies. Here the overlaps between new media and media interfaces are becoming significant as games technologies and practices are becoming more pervasive as commonplace social practices. Garrison and Dupagne (2003) argue that convergence in educational contexts affects three levels: individual, institutional and/or educational. However, it may be clearer to suggest that convergence is affecting development at the micro, meso and macro levels, including individual, institutional and educational components, where convergence on the meso – or institutional level – affects changes on the macro level such as the wider impact upon educational policy development (i.e., changes in one level will affect changes in another).

The idea of media convergence, that ‘all modes of communication and information will converge in to a digital nexus has been circulated for around 25 years’ (Mueller, 1999: 11; see also Brand, 1987; Cawson, 1998; Jenkins, 2004). The political scientist, de Sola Pool coined the term ‘convergence of modes’ leading to his conceptualisation of media convergence as a process of ‘blurring the lines between media’ (Pool, 1983: 24) and he remarked upon how the traditional separation between media such as the press, television and telephone were collapsing due to the growing use and influence of digital electronics (Garrison & Dupagne, 2003; see also: Mueller, 1999).

Interestingly, early approaches to convergence found that fastest innovation was taking place in the areas of overlap between different media forms, and this still seems to hold true today. One example of this, is the convergence between games and simulations - or ‘gamesims’ (a hybrid form) (Hays, 2005) as they have been termed (de Freitas & Levene, 2004; de Freitas *et al.*, 2006). Here the motivation of games is combined with the well-established training pedagogies used with simulations. Notably, multiplayer online role play training games, such as *America’s Army* (de Freitas *et al.*, 2006), which draw from both gaming metaphors and military simulation pedagogies, represent probably the fastest growing area of educational gaming and represent a water-shed with single-player gaming.

The uptake and use of games in educational and training contexts indicates a significant level of interest in game-based activities (e.g., Squire, 2006; Kirriemuir & McFarlane, 2004).

Inhibitors to uptake of games in 'serious' (non-leisure) contexts do exist: in particular the wide range of different terminologies and perspectives taken to games from different stakeholders including games developers, policy makers, instructional and educational developers and gamers (de Freitas, 2006a) provide a lack of cohesion amongst potential users. However, in general, the flexibility of the medium, the wide application of the formats and the immersive and interactive qualities have driven interest in using game technologies for other purposes than leisure-based and commercial and this continue to drive change, development and convergence.

2.0: Methodology

This review incorporates evidence of the convergent media forms as a starting point for a wider debate about the pervasiveness of games technologies and practices focusing upon particular issues emerging out of the literature. In particular, this paper focuses upon the convergences between gaming and cinema, gaming and the Internet, and gaming and other emergent technologies (e.g. mobile phones).

This paper provides a review of the literature to highlight evidence in support of new trends emerging in ways that games are converging with other forms. The literature review included a search of electronic databases and online journals, in addition to a hand search of selected journals. However, where there was a dearth of literature from the searches the authors have used mini-case studies from practice to illustrate key issues emerging.

2.0: Convergence in gaming and cinema

Whilst the significant impact of a convergence between the Internet and electronic games was noted as supporting diverse social gaming communities, gaming has also been converging with more traditional media including televisual forms and cinema. When compared with the early development of other similar media, such as film, this is an unusual trend. While these convergences have been widely noted, there has been little academic discussion about what these convergences may mean for education. But initial indications may show games as a more generic form demonstrating greater potential for creating links between practice-centred innovation, scope for control over user- or learner- generated content, support of open-ended learner interactions (e.g., through integrated social software tools and communications, promotion of highly visual representations and the ability to adopt narrative and scenario-based dimensions), all of which perhaps allow for greater opportunities for connecting with other media forms. It is perhaps this generic quality (and cross-disciplinarity in terms of

applications) of gaming processes that allows it to be adopted with different media forms so easily.

In the traditional media context, production often centred upon a ‘broadcast model’ where the production of content by the few was delivered asynchronously to large audiences (Hartley, 2004). A critical trend in the development of serious games is learner-driven content development (e.g., de Freitas, 2006a). Conversely, new convergent crossover forms use collaborative content production models and reach potentially large numbers of users/producers. This content is delivered asynchronously, or even synchronously, to any number of potential audiences located locally and internationally through online sites (e.g., *uTube*).

One noteworthy example of convergence between traditional media and games is provided in relation to cinema (see Figure 1). The production of machinima - a portmanteau of machine, cinema and animation involves computer generated imagery (CGI) rendering using 3D real-time, interactive games engines, rather than the expensive 3D animation software used in the industry. Usually games engines from first person shooter (FPS) games are utilized. Rendering in this way is done in real time on PCs using the available tools and resources from the game, which include: demo recordings, available camera angles, level and script editors, available backgrounds, characters and skins. Machinima provides an interesting case of crossover media, and indicates the range of possibilities for utilizing crossmedia potential (e.g., Carroll & Cameron, 2005).

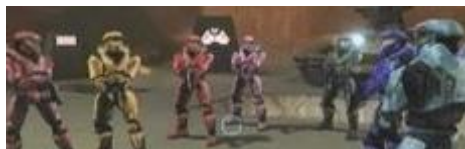


Figure 1: A scene from a popular machinima series Red vs. Blue.

While the use of machinima is becoming more widespread (Marino, 2004), probably the most fascinating aspect of machinima, an emergent aspect of game play, is the way that the tools are ‘modded’ by developers and some users in ways other than originally intended (Sotamaa, 2003), and that this is done by developers from the ‘mod’ community in a highly creative and artistic way (de Freitas 2006a). In addition, in the spirit of ‘social software’ – or Web 2.0 (Cych, 2006) – the clips are made available for sharing via *uTube* and other sites (e.g., <http://www.machinima.com/>) to the wider public. This process, supported by the wider access to broadband, heralds a new era in the development of the internet with video being made

available to the global audience through streaming capabilities (Carroll & Cameron, 2005), and has potential for educational audiences as well.

The notion of ‘users as producers’ is a key theme of these new convergent developments, and helps at least in part to explain the rapid innovations taking place. ‘Open access’ plays a central role in terms of provision of new audiences – further changing traditional notions of production and mass distribution, which in the past characterized media production and distribution models in practice.

With machinima, the techniques of film-making (e.g., montage, *misé-en-scène*, and narrative and scripting), are re-applied in a virtual 3D setting, allowing for huge potential not just in terms of ‘users as producers’ of 3D immersive spaces but also in turn having a direct impact upon traditional methods of film-making, as with films such as Gus Van Sant’s *Elephant*, which used the Columbine killings in the US as a backdrop for a ‘games-like’ filming of the narrative (Jones, 2007), showing an inter-relationship between media forms.

This correlation between different media provides new scope for how media and the uses of media and multimedia may develop, and leaves open new opportunities for user-based production of content, including scope for collaborative content production, as seen in film and television making production team models of practice adopted in games industry settings. The uses of cross-over formats such as ‘machinima’ go beyond teaching game studies, and indicate a new mode of learning based with greater emphasis placed upon content production of learners than upon assimilation of existing discourses, following models such as those established in the Not.School.net projects where assessment is based upon multimedia portfolios and teachers replaced with mentors, students becoming researchers (Moss, 2005). The approach has implications for e-assessment, including greater opportunities for peer assessment and self-assessment through portfolio work.

3.0: Convergence between gaming and the Internet

One of the most interesting areas of multimedia convergence is that of computer gaming with the internet (online gaming). It could be argued that the most revolutionary development with converging media forms has involved the Internet as a gaming medium. While online games undoubtedly date back to the MUDs (Multi-user Dimensions/Dungeons, i.e., text-based non-graphical virtual worlds) and MOOs (Multi-Object-orientated MUDs, MUDs with objects) of the 1980s, new online games offer the player 3D interactive environments in which to explore and play online (de Freitas, 2006a). Griffiths, Davies and Chappell (2003) outlined the three

main types of convergent social virtual gaming over the Internet. These are Stand Alone Games, Local and Wide Network (LAWN) Games, and Massively Multiplayer Games (MMORPGs). In particular, MMORPGs, such as *World of Warcraft*, have become extremely popular and worldwide online game subscription revenue grew 43 percent to \$2 billion in 2005, and it is expected that the segment will reach \$6.8 billion in sales by 2011 (Fox News, 2006). However, these games are mainly used for leisure purposes and studies on the effectiveness of them in social and learning contexts are just beginning (e.g. Ferdig et al., 2007; Nardi & Harris, 2006). However, a subsection of this market is the serious games market; games for non-leisure purposes, including educational software, and one commentator estimate this market to be worth \$150 million (B. Sawyer, quoted in Scanlon, 2007).

An additional category of games which have potential for education are Virtual World Applications (VWAs), such as *Active Worlds Educational Universe* and *Second Life*, these are open-ended virtual spaces where educational activities (e.g., seminars, virtual campuses, learning activities and social interactions) are being supported (Kirriemuir, 2007; de Freitas, 2006a; Prasolova-Førland et al., 2006). The crossover between online games and web 2.0 technologies is another clear trend – with live chat facilities and content generation applications usually embedded into the virtual worlds.

Although the use of computer-based simulations dates back to the 1980s, the concept of using a game (or ‘gamesim’) as an interface to a suite of training content and individual and group activities is a relatively recent one, and in part emerges from the success of online games such as *America’s Army* to engage and retain the interests of trainees from around the world to complete all stages of the game (Wardynski, 2004). In addition, socio-technological developments such as: increasing processing power, better infrastructure for networking computers, developments in software and the emergence of online communities have created more opportunities for using high fidelity interactive systems in a range of different contexts.

While this paper provides a starting point for this discussion, it is notable that gaming is becoming a powerful and popular media form. Some games are becoming considered as interfaces to a wide range of digital and multimedia content. For example, *Pulse!!!* - The Virtual Clinical Learning Lab - is a virtual training environment designed to support a range of the training needs required by nurses and medical professionals. The US Department of the Navy’s Office of Naval Research is funding the immersive virtual learning space, being developed by BreakAway Ltd, for the Texas A and M University-Corpus Christi. The aim of the *Pulse!!!* project is to provide an environment in which civilian and military medical

professionals can practice their clinical skills aiding response mechanisms for large-scale incidents (Johnston, 2007; see also: www.sp.tn.edu/pulse/index.shtml). Virtual patients, using artificial intelligence (AI) will respond in lifelike ways to environmental changes and medical techniques and skills used by the trainees. The system may be used by new trainees or for established professionals to update training. While arguably this is more of a simulation than a game, the game-like qualities (including narrative-based scenarios and different levels of engagement) indicate an instance of a 'gamesim' or hybrid game as a powerful new variant form with uses for training.

4.0: Convergence between gaming and other emerging technologies

The crossover between games and mobile devices including mobile phones, PDAs and handheld games players (e.g., *PlayStation Portable*) is becoming a topic of interest in a variety of contexts, not least educational. Mobile devices that have been regarded as 'disruptive' in classroom contexts, for example, have been seen as a device waiting for an application, and games offer the levels of engagement and content generation that could be ported fairly easily onto these kinds of devices, in addition to providing scope for content production and sharing.

Gaming on mobile devices is providing opportunities for more flexible engagements with games content and has benefits for learning. Mobile gaming via handheld consoles has been around since the early 1990s but it is only more recently that wireless networked gaming has emerged. Since we are not always near a desktop computer or console, handheld devices (including mobile phones) make the medium convenient for mobile gaming.

Several existing examples of the use of games and mobiles are being piloted in a range of contexts, including education. *Savannah* is an example of an outdoor learning game for children (e.g., Facer et al., 2004; de Freitas & Oliver, 2006). The game utilizes a simple game idea transposed onto a real space and a virtual space. The interplay between real and virtual spaces is a notable one in the development of mobile technology, and indeed the theme of transposition of the real and the virtual is one that has attracted quite a lot of critical attention (e.g., Benford, 1998). For education, the associated possibilities allow for blended solutions (e.g., field trips, distance learning, online learning, etc.).

With fourth generation (4G) mobile phones, gamers will be able to play more graphically interesting games. Within the next few years, the limiting aspects of the technological and protocol demands of mobile gaming (graphics, sound and displays) will be largely resolved. As the new generation of mobile phones accept Java programming, the high-end graphic

display can be used to deliver live video feeds for the various types of gaming to produce a 'third space' (Godwin-Jones, 2005) for learners to explore and tutors to utilise and support learning.

While increasingly there is an interest in using mobile augmented reality (MAR) for leisure time computer games, such as the *Human Pacman* mobile game (Cheok *et al.*, 2002; 2004) and *ARQuake* (Thomas *et al.*, 2002; Piekarski & Thomas, 2002) which allow players to interact with a combination of real and virtual objects in real-time and in a wide area, MAR-aided gaming is finding some educational uses as well, such as the AR Kanji learning project (see Wagner & Barakonyi, 2003) and the location-based *Mad City Mystery* AR game to support environmental science (Squire & Jan, 2007). Early indications show that these developments may well build upon effective informal approaches to learning through play (de Freitas & Levene, 2004; 2005), in addition to breaking down the barriers between physical, virtual and abstract spaces.

5.0: Discussion: Implications of convergence for gaming/future directions for cross-disciplinary research

The convergence of different media forms is leading to different modes of using media-based learning (de Freitas, 2006b), and this is having implications upon what and how learners may learn in different contexts, for example using mobile gaming content in mixed reality and location-based contexts, creating a wider blend of potential media use alongside greater opportunities for migration between pedagogic approaches. But convergence is also placing a greater emphasis upon the learner, putting the learner into a position where they can produce and actively interact with content generation, innovating practice accordingly. The greater capabilities of different media are not driving greater social interactions, but facilitating greater opportunities for learning through social interactions in different contexts. The learner as producer of content is to a great extent one of the major shifts in the process of digitisation and convergent media forms, and is reflected in the shift away from the more traditional and asymmetrical broadcast models of production by the few for the many.

The instances of the 'user as designer' or the 'player as author' are still in the earliest stages of consideration in practice and in terms of critical commentary (Murray *et al.*, 2006). However, the model if applied to other fields of study may have a critical role to play not least in the development of content for learning, including sharable content (over the internet), collaborative content (wikis and blogs) and crossover media formats (e.g., machinima). The

notion of the 'player as author' has already had interesting implications upon design, human computer interaction and notions of user-centred design (Sotamaa, 2003; 2005; Tavares et al., 2005), not least through the adoption of participatory design methods (e.g., Druin, 2002; Guha *et al.*, 2004) where users become active designers for media and multimedia products and tools (de Freitas, 2006a). This contradicts traditional usability approaches where Jakob Nielsen – an advocate of heuristic evaluation techniques and leading proponent of usability – argues that 'users are not designers' (Nielsen, 1993: 12). Other authors argue against this position in relation to online games 'mods' (e.g., Sotamaa, 2005), and in relation to other multimedia outputs (e.g., Druin, 2002).

The notion of player as producer of content and through online communications and sharing content does reorganise education, creating more opportunities for 'horizontal learning' (peer-to-peer) (Wenger, 1998). This trend is further evidenced by the more technical challenges of 'modding' of the online games communities where each 'modder' (often a developer, or individual with some experience of games development) is part of the production and consumption of the outputs in a rather more symmetrical or balanced relationship.

As demonstrated, the rise and challenges of gaming cannot be seen in isolation particularly as there is ever-increasing multimedia integration between the Internet, mobile phones, personal digital assistants (PDA), and interactive television (i-TV), and a parallel consideration of the use of these media for educational purposes (e.g. Adams, 2006; Crinon et al., 2006; Hashem et al., 2000; Mash et al., 2006). On a commercial level it may be that people are more likely to spend money in particular interactive media. For instance, the Internet can be described as a 'lean forward' medium (Griffiths, 2003). This means that the user (who is usually alone) takes an active role in determining what they do. Computers are better at displaying text than television and have a wider range of fine-tuning controls through the mouse and keyboards. This makes them more suitable for complex tasks such as obtaining insurance quotations or travel itineraries. In contrast, the television is a 'lean back' medium where the viewer (often as part of a group) is more passive and seeks less control over what is going on. The television is better at displaying moving images than computers or mobile phones. This may have implications for the types of gaming done in particular media.

What is perhaps most evident with the trend for converging games and other media is the richness of the different forms emerging from machinima to online gaming, these forms are being taken up widely and by significant numbers of users - expanding at ratios surpassing even Moore's Law (Deloitte, 2004). The convergence between games and emerging technologies such as mobile and augmented reality similarly has considerable scope for

development, with the reach of mobile gaming offering a significant market, and potential of crossover with new interfaces such as augmented reality offering greater flexibility in terms of promoting gaming experiences away from the desktop computer.

In this review paper, the authors have, in particular, identified innovations to applications, forms and practices that have significant potential for learning, e.g. machinima may have the potential to support learners as producers through allowing for reflection upon the production of learning content, which may be shared and reflected upon by peers. While games and web 2.0 technologies have clear synergies, the uptake of virtual world applications such as Second Life are showing how an emphasis upon social interactions can provide new scope for seminar and structured activities (Cole & Griffiths, 2007). While this area of convergence is clearly a new one, it is notable that many universities are already seeing the potential of the technologies (Kirriemuir, 2007), and many learners are using these technologies already to support their social activities.

The ‘major dimensions’ of convergence can partly be considered by providing greater opportunities to innovate existing technologies and applications through notable changes and increases in the usage of these applications but also in terms of observable shifts in the development of the applications. With respect to gaming and gaming practice these dimensions offer us a wide range of potential for learners to play a more active role in learning and for tutors to support learning activities in multimodal ways (Kress et al., 2001). The role of the tutor within this enriched context is not a minor one. The role has challenges of course on a pedagogic level. In addition, pedagogic strategies adopted with these technologies need to encompass the use of different media to illustrate information but also to support peer interaction, as well as helping to formulate scenario-based learning opportunities and exploratory approaches (e.g., in virtual world and serious games applications).

While convergence of media forms are clearly occurring with respect to serious games and virtual world applications, the impact of these, due to its fast-changing nature, are having more unpredictable impacts upon all areas of education: micro, meso and macro. In turn, change affecting these levels is affecting the individual learner, the institution and the educational policy and planning (see Table 1 for a summary). The need to realign these levels is critical if education is to remain a driving force in social development, but challenges remain as to how to best create effective pedagogic strategies in support of learning, how to support peer interactions, and how to design learning activities to be most engaging and relevant with new forms of media available to learners and tutors.

Level	Changing practices	Trends
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Micro: individual	Individual practices e.g.,: <ul style="list-style-type: none"> ▪ playing leisure games ▪ constructing worlds ▪ producing content 	<ul style="list-style-type: none"> ▪ Leading to blur between formal and informal, play and learning, public and private ▪ Hybrid /blended learning provision ▪ Flatter hierarchies ▪ Distributed decision-making/leadership/development ▪ Greater scope for social interactions and communications
Meso: institutional	Institutional practices e.g.,: <ul style="list-style-type: none"> ▪ game-based learning ▪ virtual world applications ▪ planning tools 	
Macro: educational	Educational practices e.g.,: <ul style="list-style-type: none"> ▪ policy development ▪ planning provision ▪ collaborative practices 	

Table 1: Changing practices and trends that parallel convergent uses of media

Evidence of the media convergence with gaming technologies and applications is leading to rapid growth particularly in the areas of overlap, as we have seen with internet gaming applications. It is also apparent that change in one level is impacting upon another leading to game-based learning applications taken up at the institutional level having implications for the wider macro level of education as a whole, promoting as it does a rethink in the way that learning content is produced, developed and delivered – and changing the way that learners relate to the content that they are consuming. While it is easy to adopt technologically deterministic explanations for this ‘behaviour’, it is essential to understand this in a very social and cultural context.

Convergent gaming forms, such as those illustrated here, may be used in support of serious applications (e.g., providing educational, training, and therapeutic benefits [Griffiths, 2005; de Freitas, 2006a]). However, as the serious games market is at its earliest stages, it is difficult to evaluate the educational value of convergent gaming as a whole. As with research into the more negative effects, it may well be the case that some types of convergent games are particularly beneficial whereas others may have little or no educational benefit. Experimental work and pilots need to be undertaken to support better understanding of these applications in practice and in support of practitioners wishing to use these, in addition studies that evaluate pedagogic strategies and support convergent media learning would be helpful.

6.0: Conclusions

While convergent gaming forms may be of potential interest to many academic stakeholder groups including educationalists, psychologists, anthropologists and sociologists, research needs to be undertaken to identify the potential advantages for education, training and therapy. Currently particular challenges exist for tutors, as it is at present unclear which pedagogic strategies are most effective, how peer interactions can be best supported in

practice contexts, and how the tutor might best support the design of activities. These challenges are made more difficult due to the relative newness and fast-changing nature of the convergent forms, and the time lag between technologies and applications emerging and the time for rigorous studies to be carried out and published.

While the review has revealed evidence of usage of some of the convergent forms in educational contexts, it is hoped that other academics will see this as a worthwhile area of research interest, and help to provide new evaluation frameworks and models to support tutor practitioners, while this work has already begun (e.g. de Freitas & Oliver, 2006) in the area of game-based learning applications, more research is needed particularly in the area of virtual world applications to support more effective learning practices.

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