IS COMPUTER GAMING THE NEW ICT TO BE INTEGRATED INTO SCHOOL CURRICULUM?

Dr Jason Zagami  
Griffith University

Abstract

Just as the integration of ICT into the curriculum took time and faced initial obstacles, so too does the integration of computer games into the curriculum. Emerging from a mixed methods research project focusing on learning and teaching with digital games in Australian classrooms, four distinct approaches to educational games are developed: Game Play as a process, Game Building as a process, Game Play as a context, and Game Building as a context. The SAMR model was applied to consider these as progressive adoptions of computer gaming that achieve increasingly transformative learning processes. Then within the use of games as contexts for learning, a Secondary Worlds model was used to then consider these contexts at Philosophic, Epic and Naïve levels. Finally, the TPACK model was extended to include computer games as a GPACKS evaluation model of the appropriate use of computer games for various curriculum content, pedagogical approaches, and student gaming preferences.

Introduction

The following details a conceptual framework emerging from a three year mixed methods study into how over two dozen teachers from twelve schools in Queensland and Victoria went about integrating computer gaming into their teaching. The framework comprises three components, a categorisation framework of developmental integration capacity derived from the SAMR model, where the capacity to utilise Gameplay and Game Building as both process and context was developed; a subcreation framework in which teachers and students engage with and contribute to the worlds generated by many games at Philosophic, Epic and Naïve levels; and a GPACKS framework to support game selection derived from the TPACK model. By exploring models developed for ICT integration, and applying these to how computer games have been used in classrooms, similarities to the ways in which ICT integration has occurred in education are evident for the emerging integration of computer games into classrooms.

Gameplay as Process, Game Building as Process, Gameplay as Context, Game Building as Context

The Substitution, Augmentation, Modification, Redefinition (SAMR) model (Puentedura, 2003) provided a framework in which to consider how teachers can go through a series of stages in considering how to utilise computer games in their classrooms.

Game Play as a process (Substitution)

Initially, teachers in the study saw games as a process by which students would learn particular knowledge and processes through playing specific games. Mapping of games with respect to what they could teach into existing curricula was seen as the first step, and initial frustration over their lack of knowledge of available games and their applicability to the curriculum was experienced. The main types of games explored were drill and practice reinforcement or training and simulation games, as these had a clear and direct relationship to learning objectives, and existing learning activities could be substituted with computer games to address the same learning outcomes.

Game Building as a process (Augmentation)
Some teachers in the study focused on the use of games to teach programming or modifying games or the game world generated by games as a creative process. The Minecraft game was particularly popular as an environment that engaged students in the creative aspects of gameplay and world building. It was seen that computer games could be used to augment creative processes, not through direct substitution, but where the game building environment provided additional creative opportunities than would not have been possible without the use of computer games.

As teachers became familiar with a wider range of available games, and more comfortable pedagogically in managing student gameplay in the classroom, most then began to explore other approaches to the use of games in their classrooms. This represented a fundamental conceptual shift akin to the shift from enhancement to transformation of the SAMR model.

**Game Play as a context (Modification)**

Frustration at finding an exact match between curriculum and existing games (or existing pedagogical practices) slowly evolved in most cases into the use of games in general as a context in which the curriculum can be addressed. Instead of seeking a specific game to meet a particular curriculum element, game play in general became an environment in which student learning could be progressed. While initially this concentrated on student engagement and motivation, in several cases teachers began to see how the use of games provided a different approach to learning. This modification of the pedagogical approach used by teachers represented a fundamental shift in their use of computer games, and greatly reduced their anxiety at finding games, to encompass exploring ways in which all games could contribute to student learning. This was also generally accompanied by a shift where the selection of specific games became less important than the concepts that could be developed through a mix of game genres and types, leading to some teachers relaxing control of the game selection process and enabling students to incorporate their own game preferences and selections to meet learning outcomes.

**Game Building as a context (Redefinition)**

A few project teachers took this a step further, and engaged students with creating their own games to be used in addressing their learning of curriculum concepts. The process of combining game creation and game play as a context, required students to delve into concepts at an increasingly complex level in order to develop games that could be used by themselves or others in learning these concepts. Redefining the use of games for learning from a process of students engaging with games and the worlds they contain, to students taking control of how games can contribute to their learning by constructing their own game worlds, was fundamentally different to Game Building at an augmentation level. Here the learning was not achieved through the development of programming skills or creative world modification, but in considering how a game world can develop concepts and putting this into action through the subcreation of complex game worlds.

**Subcreation**

Subcreation (Tolkien, 1938) is a process in which students engage and contribute imaginatively to a Secondary World, a created, consistent, fictional world or setting such as expressed in many computer games, movies and literary works, in contrast to reality, the Primary World. In order to analyse the relationship of computer games to learning, it is possible to draw upon Konzack’s (2006) interpretation of T. S. Eliot’s (1923) Mythic Method in which he details three levels of subcreation: The Philosophical, the Epic, and the Naïve.

The Philosophical level is of myths, religions and philosophies that influence the culture of a Secondary World but for which we may only ever be peripherally aware. Described by Lewis (1962) as experiencing a transposition of something bigger, that which we cannot fully comprehend but are nevertheless able to grasp the whole in fragments. By giving us the sense of exploring a world bigger than what is immediately present, we have even more impetus to explore. While few game worlds
achieve this level of detail, many player or ‘fan’ generated contributions to computer games develop to this level.

Next comes an Epic level, with geography, inhabitants and locations based on these cultures, mythologies, religions, and philosophies. Shaping the world historically through grand narratives of epic proportions, recorded in legends of heroic acts and set upon geographically plausible maps of global or intergalactic scope. Each of these epic narratives in turn inspires new epic narratives, subcreating a history that includes layers of moral choices in order for the heroes and heroines of each age to develop depth by succeeding on some moral issues and failing at others. Player stories at this level are often recorded on blogs, game bulletin boards, and machimina recordings of gameplay, and can enter into the collective lore of game communities.

Finally there is the Naïve level, comprising relatively simple narratives composed of Jungian archetypes (Tews, 2001) that are easy to grasp and imagine in the game world. Nevertheless, they relate to those narratives of epic proportions and in turn, to the cultures, mythologies, religions, and philosophies of the game world. This level is directly presented in the narrative arcs depicted in most games and forms a starting point for imaginative exploration of the game world. Through these simple narratives players can heroically embark on our own epic narratives, the achievement of which may even contribute to the mythology of some persistent game worlds.

The popularity of meta or grand narratives in Secondary Worlds and associated game worlds may reflect a societal counter to modernity and postmodern positions (Lyotard, 1979) with their grand narrative against grand narratives (Habermas, 1981; Callinicos, 1991). Grand, universal, meta or epic narratives however form an essential component of Tolkien’s fantasy literature and the subsequent fantasy fiction genre he established, many forms of Science Fiction (de Kam, 2011), and are the foundational component of the Secondary Worlds that comprise many game worlds.

Gradually most project teachers began to explore the use of games as a context and students began to engage with the games they were playing from the curriculum perspectives prompted by their teachers. Many of such prompts were focused at a Naïve level, but several teachers focus on curriculum outcomes that required students to engage with their games at epic and philosophical levels, for example, creative writing tasks set at an epic level and using various game worlds as context for this writing, and religious studies in which students engaged with the moral and spiritual aspects of game worlds. The effectiveness of these interactions lay in the very nature of computer games.

**Computer Games**

Game worlds in their various formats can achieve something that literature, TV and film based works cannot: contribution and interaction. Game Play (Wolf, 2002). The ability for the player to engage with and shape the Secondary World of the game, not just in their imagination, but also in the media that describes the game world itself. It is as if the player can contribute and rewrite paragraphs and chapters of literary texts, or modify and make additional scenes to film and TV series.

Not all games permit this, most follow a traditional literary trajectory in which players are bound by the authors’ vision of the world and the narrative they are permitted to experience. Gameplay in such games cannot shape this narrative beyond having to redo events until the correct activity to progress the narrative is achieved, victory is always certain with sufficient tenacity, and exploration constrained to that necessary for the predetermined narrative to unfold. The game world settings created in these cases often fall short of becoming Secondary Worlds, just as can occur with other media. Games in which we can imagine ourselves beyond the narratives woven by authors, exploring that which is detailed but not described in specific narratives, can create Secondary Worlds of great depth and complexity. Computer game based Secondary Worlds have the added advantage of allowing immediate contributions by players, interactively shaping the world in which they are playing, and in
this reshaping, make changes persistent, existing when a player next enters the world, and for multiplayer games, changes that affect other players in a shared Secondary World.

**Player contribution**

As yet, few computer games dynamically incorporate player-completed epics into the mythology and culture of a games Secondary World. Massively Multiplayer Online Role Playing Games (MMORPG) go partway for the individual player, but not to where the players actions can influence the Secondary World in any substantial way for other players. Guilds, factions, races and sides can simulate an epic narrative but to date they have been largely constrained by predetermined narratives created by game developers and focused more on facilitating gameplay than contributing to a deeper narrative.

Paper based role playing games however have long been able to achieve this, with players taking on creative roles at various levels from Naïve adventurers, Epic hero’s, national rulers, leaders of various races and creatures, even deities and demigods, all contributing richly to the creation of a complex Secondary World. Such games are usually played by small numbers of varying players engaging with the world at different times, where some may play as Gods creating the nature and geography of the world, as rulers shaping national and racial relationships, or adventuring heroes within a world where epic events largely occur independent of their comparatively minor contributions. Such subcreations emerge from the contribution of many players rather than a single author (Louchart, & Aylett, 2003), though some players usually set the rough framework and pull together the contributions from other players (Henry, 2003) to form a campaign setting.

Without these philosophical and epic levels of myth, computer games operate almost entirely within the Naïve level. Players are presented simply with short-term goals to be accomplished: conquests, quests, levels, experience points, equipment, badges, etc. Lacking internal consistency at the philosophical and epic levels, adventures have little meaning with shallow narratives presented, relying largely upon gameplay related goals of conquering, killing, power mongering, levelling and equipment gathering. These quests fit well into the understanding of fantasy world gameplay as a hero’s journey (Konzack, 2006), but often leave players with little substance beyond a useful escape from reality and achieve lower order educational outcomes.

Gamers however invest substantial time into the games they play and where game developers fail to provide sufficient depth and complexity, players will not leave things at this. Players want the worlds in which they play to be as rich as the Secondary Worlds they experience in other media, and will add their own contributions if required.

Roleplaying games first provided options for players (Game Masters) to modify and add to the settings (scenarios) and worlds (campaigns) that other players explored. Some computer games, Neverwinter Nights (Atari, 2002) being most notable, have modelled this approach to allow players the ability to create and manage aspects of these worlds. Ryzom (Winch Gate, 2004) allows players to edit new scenarios and upload these for other players to play, and Vendetta Online (Strategy First, 2004) uses a select Player Contribution Corps (PCC) to contribute to the games narrative by creating missions and scenarios that other players can engage with. Such contribution options are however very rare and do not go so far as to modify the underlying Epic or Philosophic aspects of these worlds, only the Naïve level of individual adventures or more commonly, additional maps for multiplayer conflicts.

To extend game narratives, developer or player created, beyond preset adventures, gamers have had to go outside the constructs of the game itself. Gamers generate and incorporate external discussion forums, blogs, wiki’s, mapping systems, screenshots and video collections to record their epic narratives, badge and ranking systems to acknowledge accomplishments, even creating social, political and economic systems external to the game. In some cases, such as the Warhammer (Games Workshop, 1983) Secondary World, gamers have built Epic and Philosophic structures through fanfiction that were eventually incorporated by game developers into the Secondary World of the
game series.

Sandbox games such as Minecraft (Mojang, 2009) can provide players with an opportunity to contribute constructions to a shared world, and these can be truly epic in scope, but without a strong or dynamic narrative structure, there are no epic stories to be created, shared and passed into a collective lore to develop the depth required for a Secondary World. Again though, players can make significant contributions in developing a Secondary World external to the game itself. One example is Massively Minecraft (Kay, Groom, & Stuckey, 2011) with its rich discussion forums, questing, leaderboards, levelling and badging - ranging from Naïve to Epic quests, recorded through blogs, screenshots and machinima, contributes to an Epic level of subcreation. What remains lacking is the philosophic level of myth, religions and philosophies that define the cultures of the world. These may emerge naturally over time from the recording and sharing of epic narratives, but without them such worlds remain focused on gameplay, however engaging, falling short of creating a Secondary World in which we can playfully and imaginatively explore on the level of Middle Earth or the Star Wars Galaxy.

Entering into the use of a complex Secondary World for education requires an increasing consideration of the epic and philosophical aspects of such worlds. Contrary to the postmodern view that we each construct our own reality, Secondary Worlds force engagement with the created worlds of others and this in turn can illuminate the epic and philosophic nature of the Primary World. In effect, Secondary Worlds can become a space to hypothesise and test alternatives, explore consequences and propose changes to the Primary World.

When players participate in this creative process, the negotiation and co-construction of a Secondary World can highlight the power relationships that so concern postmodernists. Gamers however need not retreat into their own personally constructed worlds, but in facing the challenge of understanding and overcoming difficulties in collective subcreation and of the interplay of players within these worlds, better understand such forces in the Primary World.

Games that reach the level of complexity of a Secondary World provide their players with a rich means of exploring complex moral, philosophical and religious issues. They challenge players at the level of historic myth, of epic heroes facing complex moral dilemmas, of the corrupting influence of power, and Machiavellian strategies to obtain and retain such power. Computer games at this level do not reject such power plays, they democratise them, with opportunities for anyone to participate.

Unlike other media however, gamers do not need to await further works to expand the corpus of such Secondary Worlds. They can take their imaginative contributions and place them into the game environment, adding to the subcreation themselves. By this means, the Secondary World can transcend from being the product of a single author or publisher to becoming a community activity. Some gamers find fulfilment in making imaginative contributions, subcreating additions to the world, others enjoy exploration of the world for its own sake, or overcoming the immediate challenges and problem solving in the game world, and some will undertake to better understand the nature of power within the rules and philosophies of the fictional universe.

Games can empower students to explore the philosophic nature of complex Secondary Worlds and influence this nature with contributions to the epic narratives of these worlds. In doing so, Secondary Worlds provide a lens upon which to view and understand the Primary World, or in simpler terms, to learn.

**Education through Game Worlds**

Exploration of Secondary Worlds, at various levels, has the potential to help us better understand the Primary World. It is this aspect that makes computer games particularly applicable to education. Learning about and within a Secondary World provides a necessarily simplified and abstracted application of skills and knowledge that can be potentially transferred to the Primary World. These can
range from ‘soft skills’ such as perseverance, resilience, etc. through problem solving, teamwork, creative thinking, etc. to ‘hard skills’ in studies of Geography, English, Mathematics, Physics, etc. The important facet is that within the Secondary World, knowledge and skill development can be achieved and transferred to contexts in the Primary World.

At the Naïve level, learners face relatively simple problems to solve with clearly defined boundaries, contributing to fundamental mental models with clear and specific connections to related concepts. Remembering a name and associating this with a location, and various other properties such as its reliability as a source of subsistence, probability of danger, or opportunities for adventure; of the processes of buying, selling, negotiating, barter, saving and interest; driving a racing car on different surfaces and weather conditions; understanding the weakest points in a structure and firing a catapult to optimally reduce it to rubble; or a spaceship in a slingshot trajectory to avoid orbit. Each concept can be identified and modelled in a computer game with immediate feedback provided to its successful or unsuccessful application.

At the Epic level, learners face much more complex concepts spanning multiple mental models to solve more involved problems. Managing a city with competing demands from the poor and wealthy, industry and environment, progress and heritage; prosecuting wars between nations, managing espionage networks, and delicate diplomatic negotiations; or addressing economic, political and moral choices of when it is acceptable or not to lie, steal, fight, murder, or genocide. Such complexities can be modelled and have been individually contextualised in computer games, but the interplay between concepts for successful application is much more complex than at the Naïve level. They do however generate greater intrinsic reward and potentially greater benefit and acknowledgment to the learner.

Finally, at the Philosophical level, learners require the use of brain structures that develop slowly with age and experience, and are substantially different in youth. The learners sense of self and identity, their place in the world, their contribution to and meaning they make of life, and their moral and religious belief systems, all contribute to their world view. Contrasting this view with those in Secondary Worlds can prompt self reflection and examination. While few computer games tackle this level of Secondary World development, the constructs created by players to support these worlds, the personas gamers create of themselves, their gaming reputations and nature can all be explored. Contributing to the subcreation of Secondary Worlds can provide new perspectives on how we see the Primary World, and our place within it. Gamers adopting the role of guiding new gamers in their explorations generate other opportunities for reflection, while those undertaking destructive or megalomaniacal approaches have their own opportunities to reflect on their contribution and legacy in the Secondary and Primary World.

**Gamer Taxonomy**

Understanding the motivation for gamers through taxonomies of gamer types, provides further opportunities for reflection by learners and teachers. Playnomics (2012) defined eight gamer types and the percentage of UK population associated with each: Scientist (Try new things and apply learnings. 6%), Politicians (Getting ahead by adapting to people. 22%), Socialite (Connecting to others at all costs. 7%), Habitualists (Seeking repetitive pleasure feedback. 5%), Strategists (Control environment to suit skills. 32%), Competitors (Gaining respect. Beating everybody. 11%), Collectivists (Follow social norms with badges. 11%), and Soloist (Security & controlled environments. 5%). These player types are arranged (Figure 1) on three axes, horizontally of Pursuing Pleasure (planning for pleasure vs. pleasure just happens), vertically of Problem Solving (strategy & thinking vs. reflex & intuition) and with a lens of Social Tendencies (learning through self vs. learning through others).
Figure 1. Gamer Types (Playnomics, 2012)

We have seen that the depth provided by a games Secondary World can influence the type and degree of learning possible, but what players bring to a game also plays a factor, particularly for multiplayer games and Secondary World contribution beyond the game environment. While many gamers will adopt differing types in different games, the motivation of gamers, their type, will influence the ways and levels at which a gamer will prefer to engage with a game based Secondary World and influence how these can be used to support learning.

Between Secondary and Primary worlds lies a space in which teachers can assist learners transfer experiences between realms, but such as space is foreign and unmapped for both teachers and learners. Educators faced with incorporating game based learning into their teaching face many challenges. Students have differing motivations, summarised as gamer types, for engaging with particular games, but also different preferences in the pedagogies used by their teachers, content that interests them more than other curricula, and preferences in game genres. There are a great variety of game genres and each can support the development of Secondary Worlds to varying degrees. Some game genres such as arcade games, fighting games, flight simulators or sports games are focused strongly on gameplay and less likely to sustain the development of Secondary Worlds beyond the Naïve level. Other genres such as RPG, MMO, adventure and strategy games strongly benefit from detailed and complex Secondary...
Is computer gaming the new ICT to be integrated into school curriculum?

Author Name: Dr Jason Zagami

Worlds to support gameplay.

**GPACS**

Teachers incorporating computer games into their curriculum face four main challenges in selecting games. The need for the game to suit the preferences of their students gaming types, their own pedagogical approaches to teaching, the content matter to be studied, and whether the game genre will facilitate the development of Secondary Worlds to the desired level. Modifying the TPACK model (Mishra & Koehler, 2006) developed for making appropriate educational technology selection, a Game, Pedagogy, And Content Knowledge for Students (GPACS) model (Figure 2) can be used to assist in evaluating and applying the use of games for learning. 15 interrelated factors can be considered in selecting games to fully optimise learning opportunities based on combinations of individual student gaming types, game genres, teaching (pedagogical) approaches, and the content under study. When each factor supports each other, an optimal game based learning environment should best support learning and the final consideration, the Mythic level of Secondary World development. Each of these 15 factors can be developed to varying Mythic levels - Naïve, Epic or Philosophical as best suited to the interests of students and teachers.

*Figure 2. GPACS model*

Many students will be entirely content to engage at the Naïve level of gameplay, focusing on immediate goals and problems solving, enthralled by the graphics, action and thematic aspects of a game. For learning outcomes relating to knowledge building and low level skills or concept development, this level of game is entirely appropriate. However it is unlikely to be sustained and as students exhaust the novelty of games at this level of engagement, the teacher will need to seek new alternatives or ways to progress students to higher levels of Secondary World engagement. Likewise
many teachers will be more comfortable with pedagogical approaches that best suit games at this level, relying upon clearly defined learning outcomes and instructive processes, or supporting direct instruction and facilitating teacher control of the learning process. Finally there will be content more suitable for Naïve level game worlds, particularly of fundamental skills and knowledge, where repetition and practice are required for cognitive consolidation and mastery.

Where a game does not facilitate taking students to the world level at which their achievements and engagement in the game world can influence others through epic accomplishments, students and teachers can extend the usefulness of a game for learning purposes by supplementing the games Secondary World. Creating reward and recognition systems, recording and celebrating significant achievements through blogs, wiki’s, image and video collections, organising team structures, and competitive groupings, each builds greater complexity and consistency in the Secondary World. Even further engagement can be accomplished by incorporating student contributions into the game world itself, creating scenarios, problem solving opportunities, maps, artwork and histories to deepen the Secondary World. Many teachers will be more comfortable using pedagogies of inquiry, challenge and project based learning at this level, and content that focuses on deep understandings and complex skill development such as problem solving and teamwork will often be appropriate.

Finally, for a Secondary World to engage students at the Philosophical level, teachers can assist students in comparing it with the complex issues faced in the Primary World. Moral and ethical issues can be explored through modelling and comparison with abstracted issues in the Secondary World; students can examine how geography, wealth and race influence issues; create Secondary World religions and consider their influence on the peoples and events of these worlds; and discuss fundamental philosophical, moral and ethical issues by examining student actions and responses in the games Secondary World in comparison to their views of such actions in the Primary World. While younger students may not have the cognitive structures to support engagement at this level, games can be selected to address the issues of greatest interest and applicability to older students. Teachers likewise can choose pedagogical approaches suited to this level, particularly student centred and service learning approaches, and content can be selected that addresses the foundational aspects of curricula.

In conclusion, the three frameworks presented provide a means by which teachers can integrate the use of computer games into their teaching. The developmental integration model derived from SAMR provides a framework to consider different approaches to the use of games for education, considering Gameplay and Game Building at a process and context for learning. When teachers are ready to explore the use of games as a context for learning, the concept of Secondary Worlds encompassing Philosophic, Epic and Naïve levels provides a framework in which to explore the educational application of games and game building as a context for learning; and finally a GPACKS framework to support game selection derived from the TPACK model. By exploring models developed for ICT integration, it has become increasingly evident that the widespread introduction of computer games into classrooms has the potential to follow a similar integration approach to how ICT was incorporated into the school curriculum, encompassing many of the same constraints and challenges, and representing a continuation or specialisation of ICT integration.

Acknowledgement

This work was supported by the Australian Research Council under Linkage Grant LP110200309: Serious Play: Using digital games in school to promote literacy and learning in the twenty first century. Acknowledgement is made to the students and teachers in the six Queensland schools who are Industry Partners in this research and the Serious Play Research Team: Catherine Beavis, Michael Dezuanni, Joanne O’Mara, Leonie Rowan, Sarah Prestridge, Jason Zagami, Yam San Chee. Research Assistance: Roberta Thompson, Christy McGillivray and Colleen Stieler-Hunt. Statistical consultant: Sandy Muspratt. Additional research assistance: David Elliot, Monash University.
References


Is computer gaming the new ICT to be integrated into school curriculum?

Author Name: Dr Jason Zagami


Wolf, M. (2002). Interactive: Virtual sub-creation: Two top computer games were made by Christians. Leadership U.