Multimodal Literacy, Digital Games and Curriculum

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Abstract Games are viewed as embodying core principles of good pedagogy and learning, however, it is essential that games are not understood simply as 'learning machines'. Rather, good gameplay is active, socially situated and purposeful, and intimately linked with issues of ownership, commitment and identity. This chapter focuses particularly on the textual dimensions of games and gameplay, within the context of the New Media Age, Multiliteracies and literacy constructed as design, and the ways in which the capacity to read and act upon multimodal literacies enables reasoning and analysis, and the successful progress of play. It takes the example of the citizenship education mobile learning game, Statecraft X, to explore and illustrate matters such as these. It explores and illustrates some of the multimodal forms of reading, literacy and interactions required to make sense of the game, the ways in which doing so enabled students to arrive at new insights and understandings about governance and citizenship, and the kinds of investment, reasoning and assumptions required to do so.

Keywords Computer and video games · Digital games · Games-based learning · Multimodal literacy · Serious games

Introduction

> Reasoning: Students develop an increasingly sophisticated capacity for logical thought and actions, such as analyzing, proving, evaluating, explaining, inferring, justifying and generalizing. Students are reasoning mathematically when they explain their thinking, when they deduce and justify strategies used and conclusions reached, when they adapt the known to the unknown, when they transfer learning from one context to another, when they prove that something is true or false and when they compare and contrast related ideas and explain their choices. (Australian Curriculum, Assessment and Reporting Authority [ACARA] 2013)

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In a book concerned with digital games and mathematics, this chapter focuses on multimodal literacy and its nature and role in facilitating dimensions of gameplay. It looks specifically at the multimodal forms and symbol systems that collectively create and represent the world in which players play, and the ways in which, in single or multiplayer strategy games, such as Civilization or Statecraft X, the capacity to read, understand and manipulate these systems is central to the complex reasoning processes on which progress in the game relies. The chapter begins by discussing contemporary interest in the potential of digital games to support curricular learning. It provides a brief overview of multimodal literacy and the theory of design, and introduces the Citizenship Education game, Statecraft X, and the principles underlying the design and purpose of the game. From there, the chapter goes on to look at teaching and playing the game in the subject, Study of Society and Education, in a Year 8 classroom in Queensland. It describes the ways in which analyzing, evaluating, inferencing, deduction, adaptation and other forms of reasoning were called upon and enabled as students interpreted and acted upon information presented in the multimodal symbol systems of the game.

Curricular Learning: The Promise and Potential of Games

There is increasing interest in the use of digital games in the classroom, as part of a larger enthusiasm for the potential of games, games' engines and games' design affordances to support learning (Derryberry 2007; Dodlinger 2007; Kankaanranta and Neittaanmaki 2010; Young et al. 2012; New Media Consortium 2012). Where earlier attention focused primarily on video games, and to a lesser extent console games, the last decades have seen an increasing diversity of platforms and technologies available for playing games, and the proliferation of different kinds of games. Games are played on Personal Computers or consoles, and on portable devices ranging from tablets to DS (Dual Screen portable game systems), PSP (Play Station Portables) and phones. In this chapter, the term 'digital games' is used to include but go beyond video games to include games played on these and other platforms, in a wide variety of modes and across a range of genres.

The adoption of digital games in the classroom and growing interest in the possibilities of games to promote learning has sparked considerable research into what constitutes successful games-based learning, and what it might achieve (Young et al. 2012; Perrotta et al. 2013). To be effective, games-based learning needs to be based on good pedagogy and sound learning principles, and to attend to the importance of the social contexts of play. The choice of games to support learning, and the ways they are used, should be informed by a rich understanding of the processes and principles of learning and play and by sound conceptual understandings of disciplinary areas and curriculum and pedagogic priorities. Games themselves need to be chosen and designed to make active use of the attributes or affordances of the form and to capitalize on their capacity to create experiential understandings of complex processes. These include helping players become aware of the interrelationships

between multiple elements, and the consequences of one set of actions or choices for another.

A number of factors are called upon to explain the power and attraction of games. These include games' capacity to motivate and engage players, and their potential to match assumed interests, orientations and dispositions towards learning of twenty-first century learners. A related set of qualities are the challenges games offer as "hard fun" (Pappert 2002) and "serious play" (de Castell and Jensen 2003), whereby players are prepared to persist, as games develop complex understandings at increasing levels of difficulty (Gee 2007).

The particular affordances and experiences of play in multimodal virtual worlds offer a different kind of learning than that privileged by content-driven versions of curriculum and transmission model pedagogy. The very nature of games, argues Bogost (2007), means that they prompt increased understanding through the "procedural rhetoric" that structures players' choices, actions and experience as they move through games. de Castell and Jensen argue that knowledge is created differently through playing and making games (de Castell 2011; de Castell and Jensen 2010) through "ludic epistemology"—"a remediated theory of knowledge that asks what knowledge looks like when it's encoded in the form of a game" (de Castell and Jensen 2010, n. p.).

With respect to pedagogy and curriculum, the great strength of games, particularly role-play games, is linked to the ways in which players experience games from the inside. The use of games to support learning needs to recognize the intimate connections that exist between issues of identity, relationships and players' investments in games that occur in good leisure time out-of-school play (Steinkuehler 2006; Chee 2011). Recognizing the importance of the investment of self in games, Chee argues for the design and use of games to create playful and embodied experience and understandings through connections between the games world, performance and identity (Chee 2011). In games-based learning, games design and pedagogy that effectively utilize the affordances of games enables deep conceptual understandings in subject areas.

Multimodal Literacy and the Theory of Design

Games function as an amalgam of text and action (Apperley and Beavis 2013), with both dimensions intimately linked and dependent on each other in order for the game to proceed. While it is misleading to think of games as purely textual, games are quintessentially multimodal forms, combining a wide range of symbol systems in order to be able to be played. Games incorporate image, sound, movement, color, language, symbol, gesture, graphic and spatial representation and more. They require high levels of multimodal literacy from players, including the capacity to identify and attend to a wide range of textual elements and their interrelationships, simultaneously. "Learning about and coming to appreciate interrelations within and across multiple sign systems (images, words, actions, symbols, artifacts, etc.) as a

complex system" argues Gee (2007, p. 41), "is core to the learning process". Design, with its double resonance as both noun (the design of the game) and verb (you design a new character), provides a way to think both about the mix of literacies and multimodal symbols that students 'read' on screen, and about the productive component of play where creating is an important part of coming to understand, and making things one's own. Design is central to the kinds of learning prompted and enabled by video games, with good design on the part of the game essential for successful play, and players actively engaged themselves in design, as they interpret and play (Gee 2007). Many of the 'principles of learning', that Gee argues video games exemplify, hinge on the notion of design. These include the 'Active, Critical Learning Principle' where "all aspects of the learning environment (including ways in which the semiotic domain is designed and presented) are set up to encourage active and critical, not passive, learning" (p. 41); the 'Design Principle', where "learning about and coming to appreciate design and design principles is core to the learning experience" (p. 41).

As the metaphor of design makes readily visible, it is what people *do* with the semiotic elements they encounter that creates meaning—that is, semiotic elements go hand in hand with intentions, actions and practice. Reading, viewing, writing, speaking and other forms of communication are active and responsive processes. Literacy works as social practice, serving particular purposes and embedded in real-world contexts. New Literacies scholars highlight the active ways in which literacy works to achieve certain purposes. Literacy practices:

> are what people do with literacy … they also involve values, attitudes, feelings and social relationships … [and include] people's awareness of literacy, constructions of literacy and discourses of literacy, how people talk about and make sense of literacy. These are processes internal to the individual; at the same time, practices are social processes which connect people with one another, and they include shared cognitions represented in ideologies and social identities. (Barton and Hamilton 2000, pp. 8–9)

Citizenship Education and Statecraft X: Gameplay, Learning and Identity

Statecraft X (Fig. 1), designed by Yam San Chee and colleagues at the National Institute of Education, Singapore, is a multiplayer game set in the mythical kingdom of Velar (Chee et al. 2010). The game is played on iPods or iPhones. In teams of five, playing in role as governors of one or more towns in one of four factions, players work through a series of challenges and scenarios as they build up their own towns, conquer others and strengthen these in turn. Initially competing with each other to win the leadership of the kingdom, in the latter part of the game they must work together to defeat an external threat. In doing so, they need to manage their economies and citizenry, including trading with other towns and factions, building infrastructure such as hospitals and barracks, managing citizens' housing, training and employment, together with their health and wellbeing, combat internal

Fig. 1 Statecraft X splash page <http://cheeyamsan.info/NIEprojects/SCX/SCX2.htm>

and external threats, build and use their defence forces, and develop strong and stable societies. Their citizens are a mixed bunch, who must live together harmoniously. No one town has all of the resources required to function effectively—e.g., wood, ore, water, food—so trading is essential. Money is shared between faction members, and cooperation and coordination between faction members is essential to ensure success. The game itself is played outside class time, with teams working together or competing at home or during breaks at school, for those students who do not have broadband access at home.

Specifically designed to take advantage of new media, student experience and "education in the age of new literacies" (Chee 2011, p. 98), Statecraft X is based on a view of learning in which experience is central. Consistent with the observation that games "create new social and cultural worlds—worlds that help us learn by integrating thinking, social interaction, and technology, all in service of doing things we care about" (Shaffer et al. 2005, p. 105), Statecraft X immerses students in a rich imaginative world where they take on roles and responsibilities and follow these through with intensity. Unlike numerous 'educational' games, where the aim appears to be on 'doing school' and acquiring content more effectively, in Statecraft X, the focus is not on 'learning about' but rather, 'learning to be' (Chee 2011). Chee's games—Statecraft X, <http://cheeyamsan.info/GLI_StaticArchive/statecraft-x.html> and Legends of Alkhimia <http://cheeyamsan.info/GLI_StaticArchive/legends-of-alkhimia.html>—seek to capitalize on the affordances and opportunities of massively multiplayer online games to bring about learning of this kind. This enables the development of insider insights and understandings of core processes and concepts at a deep level. Chee cites Thomas and Brown's 2007 "implicit plea for a shift in pedagogical practice to one that would better leverage the unique affordances of such online gaming environments that might better serve the needs of students today" (2011, p. 98). He draws on Dewey, Mead and Bourdieu to:

reframe learning … as a process of becoming: a perspective on learning that finds reso-
nance with approaches such as situated learning (Lave and Wenger 1991), communities
of practice (Wenger 1998), and discourse as constitutive of becoming (Roth 2010). This
reconstruction then allows me to ground game-based learning on the central construct of
performance, as explicated by the Performance–Play–Dialog Model. (2011, p. 99)

In this, identity is central. So too, is recognition of the out-of-school contexts and
characteristics of leisure time play. The narrative structure of the game, the ways in
which players are positioned and invited in, and competitive, communicative and
collaborative aspects of the game all work to create opportunities for immersion
in the narrative fantasy of the game. So too do the circumstances under which the
game is played. Echoing 'any time any where' patterns of connectedness and play,
gameplay itself takes place in out-of-school time, unconstrained by formal param-
eters of classroom timeframes, pedagogic structures and agendas, and in tune with
when players have the leisure and desire to play.

Teaching and Playing with Statecraft X: Multimodal Literacy and Gameplay

In a Year 8 classroom in South East Queensland, teacher Peter McVeigh called on
Statecraft X to teach core concepts in Citizenship Education as part of the Studies
of Society and the Environment curriculum. Peter blogged about his experience of
the trial run of the game:

> Game play was good. Every 30 mins a new turn would occur allowing students to add to
> buildings adjust tax rates employ citizens etc. Budgetary constraints were our downfall.
>   I realized at this point that the game had many benefits that I had not seen in other games.
> These were:
>
> • Students interacted with each other during the game and outside of the game via mes-
>   sages etc…. I think some of them were face timing as well.
> • Game had a directed structure to it. There were sequenced events planned to occur at
>   specific times to force the player to react. Students would benefit from this as they could
>   explore system changes such as taxation and immigration policies and directly observe
>   the results.
> • Although the game had a directed nature, individual responses to issues were not limited
>   to a single choice. This was beneficial as it allowed great classroom discussion of cause
>   and effect and Cost Benefit of social/political and economical problems.

From the earliest times, it was clear that mathematical considerations—budgetary
constraints particularly—were central to the game. The management and allocation
of resources, calculations regarding cost and availability, profit and loss, the likely
consequence of choices, faced students in every turn. So too did decisions about
their priorities as governors. Should they spend money on building up their armies?
Educating citizens? Better housing? Social harmony? What would be lost as other
areas were advantaged? What could they do? What did they have to do? How would
they manage in situations where there seemed to be no choice? As Peter noted, the

game "allowed great classroom discussion of cause and effect and Cost Benefit of social/political and economic problems".

Following the trial, the game was loaded onto iPods, and the iPods given to the Year 8 students in his class. Peter blogged about their response:

> DDay+1 Students were all excited about the shiny new toys.
> DDAY+2 I notice clumps of the students in the playgrounds with iPods and serious discussion on how each of them was going to takeover as overlord of the virtual world. Discussion was good; I just need to develop a way to bring it to the classroom for the week's 2×70 min lessons.

The Game went well:

> Newest Blog Entry
>   I have now had a chance to run the kids through two lessons.
>   Lesson one: I thought that the games experiences were extremely valuable for aiding class discussion.
> Topics
>   Lesson One: International Trade: We explore how limited resources and impeded trade between nations/states have the potential to lead to conflict. Used Trade in the 800AD period to illustrate point. Students were able to connect to this idea by drawing on in-game examples. I was surprised at how quickly the kids moved through the discussion as I had delivered this lesson in previous years.
>   Lesson Two: Cost Benefit Analysis of Social Systems e.g. medical, social programs etc. The students again worked through this discussion with valuable contributions from a wider range of students than normal. Students again connected the game to the examples that I offered in explanation. This worked very well.

Students could play from home or anywhere where wireless access was possible. The server was on from 6.30 in the morning till 11 pm at night. Thirty-minute breaks between turns provided time for the consequences of moves undertaken during play to become apparent and be put into effect.

Students' experience of playing the game, and the ways in which through gameplay they gained increased insight into the aspects of citizenship and governance, were centrally linked to the use of textual forms that were small, readily recognizable and full of meaning. Further, it was essential that players had a shared understanding of what these symbols, icons and images referred to and "meant", as meaning was built through players' interpretation and engagement with these forms of text. Reading and texts are closely interrelated, with this tight interrelationship integral to play. Textual elements gain in meaning through the practice of being read. Play takes place through a fluid and invisible exchange between symbols, actions and the broad sweep of experience, expectations, paratextual understandings and more that characterize gameplay. In playing Statecraft X students were constantly interpreting the information provided in individual symbols and images, and the patterns created by their juxtaposition. These interpretations formed the basis for understanding and action, and the calculations and reasoning that drove the decisions that they made.

As Kress (2003) notes, the logic of the screen is one where space and simultaneity prevail, unlike the page, where the logic is one of sequence and time. Multiple semiotic systems provide economically coded information on the small screen. The game relies on the use of a range of symbol systems other than words to provide

Fig. 2 Statecraft X running on iPhone: Symbols, numbers and icons <http://cheeyamsan.info/NIEprojects/SCX/SCX2.htm>

information in meaningful and recognizable ways. Wordlessly, the screen presents a clear and economic rendition of the state of the town that is its focus, presenting information in visual form that provides a detailed account of that moment in the overall state of play, with implications for what has gone before and might come after.

The screen in Fig. 2 contains only one 'word' (it is in fact an abbreviation of two), but is full of meaning. How is it that students in Peter's class could gain sophisticated insights into core principles and concepts of citizenship through the experience of play with information presented in almost totally non-verbal ways? What information does the screen provide, and how does it do it?

The screen presents information in numerous ways. Across the top, images functioning as symbols, juxtaposed with numbers, indicate the town population, available stocks of money, water, food, wood and so on—items essential for the welfare of citizens to meet needs as basic as hunger, thirst and the need for shelter. Quantities and components represented call for judgments to be made about the wise use of them to achieve social and political ends—sophisticated decisions to be made, for example, about expenditure, national and international relations and trade. The screen is organized spatially, with different information signaled in different parts. A water tower has been constructed, reflecting the priorities in earlier decisions about expenditure. The water tower, huts, houses and other buildings are located in a schematic but aesthetically pleasing landscape, complete with river, grass and trees. Down the right hand side, a string of what looks like empty circles or buttons are spaces where icons such as hearts or houses also provide important information to the player.

On other screens, space, towns and landscape have their own images, patterns and relationships, with rules governing navigation, travel and arrival, the negotiation of entry, relationships of one town with another, takeovers and so on (Fig. 3).

Fig. 3 Statecraft X running on iPhone: Battle for control of the capital city <http://cheeyamsan. info/NIEprojects/SCX/SCX2.htm>

Other screens, and pop up and drop-down boxes provide further information about citizens, the mix of races, levels of happiness or unrest, the available workforce and so on, while a further set of screens enables messaging between faction members with explanations, requests, bartering and more.

Multiple semiotic streams work simultaneously, across physically diverse locations and networks in synchronous time, with the 30-min timeframe providing mandatory disciplinary parameters during which actions initiated during the previous turn take effect. The literacy practices required to play the game depend crucially on the player's knowledge and capacity to read the multiple and changing patterns of symbol, number, image and so on. It was these practices, these literacies, and the design of the game, coupled with the depth of investment players bring to their roles within the game, that enable the core tenets of Citizenship Education to be lived and experienced firsthand. Students in Peter's class were engaged in a complex set of literacy practices as they played, both individually and as faction members, reading the screens in front of them, juxtaposing information presented in highly abbreviated, visually appealing forms, hypothesizing about what might have happened since they last played, what to do next, and what the effect of the choices they make now might be.

Reasoning, Resources and the Group: Analyzing Gameplay

As the game drew to a close, students in the different factions were interviewed about their experiences, and invited to reflect on their progress, what they had had to do, what they had learnt, and how they felt about it all.

Jim, from the Phoenix faction, described what his group had achieved.

Qu: How are you going so far?

Jim: It's a bit up and down in a lot of situations and times we've gone into debt and some-times we've had hardly any resources. But we've pulled through in a lot of those situations, and been able to get different resources to other members of the group and been able to help them out of more situations.
Qu: How have you been able to do that?
Jim: Send, do trading offers with them. Send them for example 20 wood for 30 gold or something like that, and also to defend them if they are attacked by military forces. You can send a military force to defend them.
Qu: Do you have an idea about how well your faction is doing relative to others?
Jim: I'm pretty sure we're coming second
Mark: Yeah, we're doing pretty well compared to some other factions. Other factions have had people starve.
Jim: We haven't had many people down like that. Some other factions have been attacked by the neighboring kingdom. Something (I can't remember its name at the moment) but it's coming, and is attacking our kingdom and some people have lost quite a few towns from them.

The relative success of Jim's faction was linked to the group's management of resources and trade, and recognized the interrelationship of trade, income, defence and social wellbeing needed if the faction was to survive. Managing resources was a challenge, but students became rapidly aware of the needs, choices and interrela-tionships entailed:

Jim: I just tried to keep my people happy by having free health care and we had about three or four people in the healing center. I upgraded them all to level 3.
Qu: Right. That was expensive to do that.
Jim: Yep, but I sold a lot of gemstones so I could do it.
Qu: OK, and you said you were trying to keep them satisfied. How did you do that?
Jim: Well, I noticed my taxes were incredibly high so as soon as I lowered them the happi-ness was increasing. Then I thought if I keep doing this well, this happiness is going to go up to the happier consumer things so I get some money out of it.
Tom: Yeah, and then we just sell lots of gemstones. Gemstones are a lot of money.

The actions of Jim's group, and his explanation of them, show 'logical thought and actions' just as the ACARA account of 'reasoning' describes—analyzing, eval-uating, and evaluating the situation, inferring causes and working out solutions, be that favorable trade where needed, or military defence. Mathematical reasoning is well in evidence in Jim's account of his faction's choices, strategies and success.

Con faced other challenges, but like Jim, analyzed his faction's needs, available resources and governance priorities. His account of how he saw his responsibilities, with respect to the resource he had plenty of (wood), shows mathematical reason-ing well in evidence as he recognizes and acts on the consequences of supply and demand, even to the point of his own eventual loss and redundancy.

Con: I had a different environment. It was a lot harder to keep everyone in my town happy, but I had other responsibilities because I was the only person in our faction that began with wood, that could actually build a wood mill so I was having to give wood to most of the people in my faction in order for them to build certain factories and resource industries. So I was very counted on in the beginning, and then I'm not any more. They built their own.

Group members not only understood and correctly interpreted the shifting pat-terns of images, symbols and icons that emerged after each round of play, and what

this meant in relation to the power of individual faction members and towns, they also developed an understanding of how the whole faction was affected and a mindset that recognized the need to protect faction members and their towns and citizens as a whole. In doing so, they achieved some of the main aims Peter had for introducing the game into the curriculum:

> The big problem doing the civics component [of the SOSE curriculum] is trying to get the kids to think at a higher level. "We should just build the hospital and we should build the roads and everybody should have access to computers and all those types of things"—it's really hard for them to understand it's a resource-driven model…. I was very impressed with the way that kids could draw upon in-game experiences and compare and contrast them against systems within state, systems within countries etcetera. I thought that was a real strength of the game.

The awareness of the need for faction members to work together was also a key factor in the ways in which the winning faction, Griffin, got themselves organized, with "good communication" identified as central from the outset.

> Qu: OK, and so you're the Griffin faction. What was your faction like? How would you describe your faction?
> Caroline: good communication.
> Qu: so, good communication.
> Caroline: Yep.
> QU: What form did your communication take?
> Caroline: for trade and stuff we worked really well because I was the center of it all and everybody knew me, so we had really clear communication lines with each other. Yeah, it was good.
> Anna: We were all friends before the game. There was no danger of someone backstabbing someone else, so if one town was getting attacked, like for example if Kiera's town was getting attacked everyone would quickly gather their armies and defeat the people.
> Qu: Did it work? What happened when you did that?
> Caroline: It worked, we killed some people.
> Qu: So how successful was your faction?
> Caroline: We got the capital city, so...
> Qu: so pretty successful.
> Caroline: Yep.

Caroline took responsibility for overseeing the management of the resources of her team as a whole, creating a book "where I put everyone's names and what they were spending so that we didn't go over a certain amount of money, so that we would still have enough money in case another nation attacked us". Other team members contacted her for advice about whether they could build. She monitored who was playing as turns rolled round—"if someone wasn't playing, trying to communicate with them so they could trade". She stayed up late and woke up early to check what was happening during hours when the server was alive, to ensure the faction stayed ahead of the game. The responsible exercise of judgment, communication, an awareness of the interrelatedness of elements of governance, and the management of trade and resources were intimately linked to social cohesion and prosperity.

Identification and investment in the game were key elements in developing greater insight into core issues and concepts in citizenship education. As Jim described his insights into the experience of governorship "it's different than just read-

ing from a textbook. It actually lets you immerse yourself into the game and into the more knowledge of the game that you're playing and it more engages your brain as to what you're doing". Sam similarly contrasted traditional pedagogy and what he had learnt about the workings of the 'real world':

> It shows there's a very different aspect to it. It's not simply sitting behind a desk simply writing papers or something like that. There's a lot more than that. You've got to be managing a whole bunch of different aspects of life. In the game there was food, water. You had to make sure that there was food and water for the citizens, shelter, military forces and you had to make sure that if bandits or something came to your city that you could protect, I guess that sort of thing. To make sure that your citizens were happy. It's a lot more difficult than you think it would be just starting off playing this game.

What Does it All Mean?

Working with games in school is not easy, and it is important that research into games-based learning acknowledges the messy realities and on-the-ground conditions in schools (Perrotta et al. 2013; Erstad and Sefton-Green 2013). Not all students were equally engaged through the whole process, particularly those whose factions began to lose. While not all students enjoyed the same level of involvement and success, however, the experiences of Jim, Caroline and their teams provide a good illustration of games' possibilities. Peter was keen to use Statecraft X again, in the light of his experience with this group—the most academic stream. He was curious to see how it might go with a more mainstream group and optimistic about the possibilities:

> The level of depth of students' insight was really good. I haven't been able to teach some of those concepts that I've taught at grade 8 levels to the level that I was able to before. Now having said that I want to limit that statement by saying that this was an academic summit class. It would be very interesting to see how a more mainstream class would have picked up on the same things.

The complex understandings and interrelationships that Peter describes rely heavily on mathematical reasoning, enabled by the economic onscreen images and symbols throughout the game, and students' capacities to work with these. It is clear that traditional print literacies and resources will continue to be an important part of school education in the immediate future, and for a considerable time. It is also clear, however, that multimodal, digital literacies and the capacity of well designed digital games to make use of these can enhance and deepen conceptual understandings in subject areas. Students like Jim, Caroline and Sam, at home in the digital world, had no trouble following the interwoven threads and relationships within the game, presented in iconic multimodal form. The nature and affordances of online digital texts, literacies and technologies enable high-level understandings to be gained. While motivation, engagement and 'fun' are the most commonly touted qualities advocated in relation to the classroom use of games, it is the capacities of these new forms of text and literacy, and the affordances of games themselves,

particularly the opportunities they offer for personal investment and 'learning how to be', that would seem to offer the most in providing opportunities for students to gain sophisticated disciplinary and process knowledge, in the in-school use of games.

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