The Role of the Writer in Creating Narrative-Driven Digital Educational Games

by

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I am the author of the thesis entitled

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submitted for the degree of Doctor of Philosophy

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Abstract

In an educational setting, digital games are typically used to facilitate the acquisition of knowledge or skills, and to promote attitudinal or behavioural change. Narrative-driven digital educational games seek to enhance learning by leveraging the narrative and mechanical affordances offered by digital games, including well-realised game worlds, sympathetic characters, and carefully-balanced reward systems. As the writer of two narrative-driven digital educational games, I have experienced first-hand the creative and logistical challenges one faces when creating games that must be both educational and entertaining. The narrative inquiry at the heart of this thesis is designed to explore these challenges by giving voice to those who are best placed to articulate them: the writers.

Ultimately, this inquiry is intended to answer the question ‘How can the writers of narrative-driven digital educational games improve these games’ potential effectiveness using action and textual elements?’ In order to address this question, I spoke first with 4 expert writers from the broader games industry, who have been responsible for writing best-selling titles and cult classics. I wanted to canvas their opinions on the opportunities, and challenges, for educational game writers. They were candid in their responses, and suggested that writing narrative-driven digital games is difficult at the best of times; writing games that find the correct balance between entertainment and education adds another layer of complexity. After speaking with these experts, I undertook two interconnected studies to further elucidate the writing process for such games.

In order to address what was already known about the effectiveness of narrative-driven digital educational games within the academic literature, I conducted a critical review of 130 peer-reviewed articles in which I examined the games’ success in achieving their educational aims. The results of this review suggest that, when done well, such games have the potential to promote engagement, enjoyment, motivation, knowledge acquisition, and attitude or behaviour change with learners of any age, within a range of disciplines, and in varying contexts. More than 60% of the articles included within this review suggested that the games they tested were successful in achieving all of their educational aims, while over 30% demonstrated mixed results. In most cases where a study showed a game to have achieved mixed results, the researchers may not have found an improvement in one area, such as knowledge acquisition, but they noted gains in others, such as engagement, motivation, and attitude change. In fact, these three outcomes were deemed to be have been achieved in over 85% of studies in which they were measured, while skill acquisition was deemed to have been effective in more than 90% of cases.
The drive to understand *how* and *why* such games work, and the skills required to bring these games to life, underpinned the second study contained within this dissertation. To explore these issues in detail, I analysed 5 highly-respected narrative-driven digital educational games, and interviewed the writers responsible for their creation. I then conducted a thematic analysis of game and interview data using the *Games as Action, Games as Text* framework (Beavis & Apperley, 2012). The findings reveal that designing such games requires specialised skills, attention to detail, and dedication on the part of those who write them.

These writers must consider not only the usual mechanical, narrative, and educational elements that the player will encounter during play, but other key features. These include creating authentic learning opportunities; fostering multiliteracies; appreciating how the underpinning ideology might best be realised through gameplay; and understanding the impact of paratexts and the gaming context on the game play experience. The findings of this study confirm the educational potential of both purely educational games and games created for both mainstream and educational purposes. They also demonstrate the value of locating educational games within a wider programme of study.

*Games as Action, Games as Text* (Beavis & Apperley, 2012) was originally designed as a curriculum development framework. This study represents the first time that it has been used to analyse digital games themselves, a process that has required me to define and elaborate upon some of its components. Having done so, I recommend that others use the framework to analyse educational and mainstream games, preferably in conjunction with the definitions of its features and guiding questions that I have created. I have concluded my study by providing recommendations for those who wish to build upon this work by using the framework as the basis for narrative-driven digital educational game design.
# Table of Contents

ACKNOWLEDGEMENTS ........................................................................................................ III

ABSTRACT ............................................................................................................................. IV

TABLE OF CONTENTS ......................................................................................................... VI

LIST OF FIGURES ................................................................................................................. IX

CHAPTER 1: INTRODUCTION .............................................................................................. 1

1.1 Background ................................................................................................................ 1

1.2 Rationale ...................................................................................................................... 4

1.3 Aim ............................................................................................................................... 6

1.4 Thesis structure ............................................................................................................. 7

1.5 Importance of the study and intended audience for the findings ................................. 8

CHAPTER 2: LITERATURE REVIEW ................................................................................... 9

2.1 The importance of Story in society and culture ........................................................... 10

2.2 The socio-cultural importance of play ...................................................................... 12

2.3 Defining Narrative ...................................................................................................... 14

2.4 Chatman’s narrative elements applied to traditional and interactive texts ............... 17

2.5 Understanding games for learning ............................................................................. 19

CHAPTER 3: RESEARCH METHODOLOGY ..................................................................... 27

3.1 Overarching methodology: Narrative Inquiry ............................................................. 28

3.2 Method ........................................................................................................................ 30

3.3 Positioning myself in the research ............................................................................. 45

3.4 Underlying assumptions ............................................................................................ 48

3.5 Ethical issues and risks ............................................................................................... 49

CHAPTER 4: A CRITICAL REVIEW OF THE EFFECTIVENESS OF NARRATIVE-DRIVEN DIGITAL EDUCATIONAL GAMES ................................................................. 51
4.1 Material and methods ............................................................................................................... 51
4.2 Results ........................................................................................................................................ 55
4.3 Summary ..................................................................................................................................... 67

CHAPTER 5: CASE STUDY 1, HISTORY OF BIOLOGY ................................................................. 68
5.1 Games as Action ......................................................................................................................... 70
5.2 Games as Text ............................................................................................................................ 75
5.3 Summary ..................................................................................................................................... 81

CHAPTER 6: CASE STUDY 2, HIGH SCHOOL STORY .................................................................. 82
6.1 Games as Action ......................................................................................................................... 83
6.2 Games as Text ............................................................................................................................ 88
6.3 Summary ..................................................................................................................................... 96

CHAPTER 7: CASE STUDY 3, GLOBAL CONFLICTS: AFGHANISTAN ...................................... 97
7.1 Games as Action ......................................................................................................................... 99
7.2 Games as Text ........................................................................................................................... 105
7.3 Summary .................................................................................................................................... 112

CHAPTER 8: CASE STUDY 4, HACK ‘N’ SLASH ..................................................................... 113
8.1 Games as Action ....................................................................................................................... 115
8.2 Games as Text ........................................................................................................................... 120
8.3 Summary ................................................................................................................................... 125

CHAPTER 9: CASE STUDY 5, THE VIRTUAL DEMENTIA EXPERIENCE™ ................. 127
9.1 Games as Action ....................................................................................................................... 128
9.2 Games as Text ........................................................................................................................... 133
9.3 Summary ................................................................................................................................... 137

CHAPTER 10: DISCUSSION ........................................................................................................ 139
10.1 What can expert writers tell us about the complex nature of writing for games? .... 140
10.2 What does the existing academic literature suggest about the effectiveness of narrative-driven digital educational games as educational tools? ......................................................... 142

10.3 To what extent do five best practice narrative-driven digital educational games function as action and as text? ............................................................................................... 146

10.4 How are narrative elements used, within these games, to promote their learning objectives? .............................................................................................................................. 157

10.5 Does the analysis of the games’ construction, and interviews with their writers, support the validity of the Games as Action, Games a text framework (Beavis & Apperley, 2012) as a way of understanding game design? ................................................................. 160

CHAPTER 11: CONCLUSIONS AND RECOMMENDATIONS .................................................. 163

11.1 Strengths and Limitations .................................................................................. 167

11.2 Recommendations .............................................................................................. 168

BIBLIOGRAPHY .................................................................................................................. 173

APPENDICES ....................................................................................................................... 182

Appendix A: Semi-structured Interview Questions with Key Informants in March/April 2015. .............................................................................................................................. 182

Appendix B: Plain Language and Consent Form for Key Informants, March 2015. .......... 184

Appendix C: Games as Action, Games as Text Definitions (Compiled by L. Jackson, 2015) ........................................................................................................................................ 188

Appendix D: Guide Questions for Analysis Using Games as Action, Games as Text (L. Jackson, 2015). ...................................................................................................................... 194

Appendix E: Semi-structured Interview Questions for Writers of Narrative-driven Digital Educational Games in June/July 2015. .............................................................................. 204

Appendix F: Plain Language and Consent Form for Educational Game Writers, March 2015. ........................................................................................................................................ 206

Appendix G: Plain Language and Consent Form for CEOs/Directors, March 2015............ 209

Appendix H: Critical Review of the Literature Surrounding the Effectiveness of Narrative-driven Digital Educational Games ........................................................................................................ 213
List of Figures

Figure 1. A Diagram of Narrative Elements (Chatman, 1980, p. 26) .............................................. 15
Figure 2. Games as Action, Games as Text (Beavis & Apperley, 2012, p. 12) .......................... 37
Figure 3. Prisma Flow Diagram (Moher, Liberati, Tetzlaff, & Altman, 2009, p. 877) .......... 54
Figure 4. The effectiveness of narrative-driven educational games (L. Jackson, 2016) ........ 56
Figure 5. Synthesised articles 2000-2015 (L. Jackson, 2016) .................................................. 71
Figure 6. Effectiveness by subject area (L. Jackson, 2016) ..................................................... 59
Figure 7. Effectiveness by genre (L. Jackson, 2016) ............................................................... 61
Figure 8. Effectiveness by educational outcome/s (L. Jackson, 2016) ..................................... 66
Figure 9. Promotional image for History of Biology (Spongeland, 2010) ................................. 70
Figure 10. Examining a coin to discover a hidden clue (Spongeland, 2010) ......................... 71
Figure 11. RNA Gallery’s fictitious website contains clues to a puzzle (Spongeland, 2010) 78
Figure 12. A promotional image for High School Story which changes “theme” depending upon the season (Pixelberry Studios, 2015) ................................................................. 83
Figure 13. One example of a school campus (Pixelberry Studios, 2015) ............................... 86
Figure 14. New characters of different types can be won or purchased throughout the game (Pixelberry Studios, 2016) ................................................................................... 89
Figure 15. The SAT preparation quest begins (Pixelberry Studios, 2016) ............................ 92
Figure 16. Farooq, an elder, welcomes the player to the village (Serious Games Interactive, 2014) ................................................................................................................................. 100
Figure 17. The driving level begins (Serious Games Interactive, 2014) .................................. 102
Figure 18. Searching the rubble of the school for clues (Serious Games Interactive, 2014) 105
Figure 19. Confronted by the Taliban (Serious Games Interactive, 2014) .......................... 108
Figure 20. Rescued by the ISAF (Serious Games Interactive, 2014) ..................................... 110
Figure 21. A promotional image for Hack ‘n’ Slash (Double Fine Productions, 2014) ....... 115
Figure 22. Alice finds her USB sword (Double Fine Productions, 2014) ............................ 116
Figure 23. Altering the attributes of a Swamp Turtle (Double Fine Productions, 2014) ... 118
Figure 24. Alice’s nemesis, the Evil Wizard, is intent on thwarting her progress (Double Fine Productions, 2014) .................................................................................................. 122
Figure 25. In Parkville, Australia, the audience sits in a purpose-built studio, watching on as a facilitator controls the game’s protagonist, Myrtle, using a Microsoft Kinect (Alzheimer’s Australia Vic, 2013) ................................................................. 130
CHAPTER 1: INTRODUCTION

In my view, compelling stories are based on a kind of basic structural logic of how stories work, around conflict, around empathy, around a detailed depiction of human relationships that we can sympathise with and struggle with. (N. Fortugno, interview, 15 April, 2015)

1.1 Background

Since I was a child, narrative – presented verbally, in books and other written media, on film and radio, and in games – has been a companion and inspiration to me. Appreciating not only the story, its characters and settings, but the way that these are constructed has, since my early twenties, become a professional concern. In keeping with the intention of narrative inquiry (Clandinin, Pushor, & Orr, 2007), I will highlight how my perception of the importance of narrative has changed over time, by place, and due to my personal and social conditions. By doing so, I hope to illustrate how my “feelings, hopes, desires, aesthetic reactions, and moral dispositions” (Connelly, Clandinin, Green, Camilli, & Elmore, 2006, p. 480) have been shaped by narrative. It was narrative that allowed me to engage with, understand, and find meaning within education, as both a student and a teacher. And it is narrative that has allowed me to produce works in various media to connect and communicate with readers, viewers, and players I would never otherwise meet.

1.1.1 The role of Narrative in my life as a learner

In the early years of secondary school, I was not a particularly good student. I wouldn’t describe myself as a bad student either, but I tended to be very selective about what I spent my time on. If I liked a subject, I would work hard to complete the work to a high standard, even if it meant working in my spare time. If I wasn’t interested, though, there was nothing my teachers could do to get me to work. The subject I was least interested in was Mathematics. I don’t remember ever realising the connections between the content knowledge I was being asked to learn, and the world around me. It seemed purely abstract, and I was unwilling to accept my teacher’s suggestion that I ‘might need it one day’ as a reason to pay attention.

Despite my general loathing for the subject, it provided me with one of my strongest memories of academic triumph from that period. A friend and I, given the opportunity to design our own project, decided to take a shared interest – our love of superheroes – and use mathematics to understand their powers. Engaged in the problem at hand by the narratives of
the hundreds of comic books we had read over the years, without any mathematical skills between us we located appropriate sources and began hypothesising, measuring and comparing to establish the tensile strength of Spiderman’s web, the weightlifting capacity of The Incredible Hulk, and whether Flash could beat Superman in a foot race. When we received an ‘A’ for the project – my first and only A for Mathematics, needless to say – the grade hardly registered.

1.1.2 The role of Narrative in my life as a writer

I began writing seriously at the age of eighteen, and won first prize in my Secondary School’s inaugural writing competition. The school gave me a trophy and a cheque for fifty dollars - my first payment as a writer. I later used the short story as the first chapter of a novel which I worked on during the following years as I undertook a degree in creative writing. During this period, through many drafts of the fifty or so chapters contained in the book, I began to appreciate the subtle variations in structure, point of view and time, which distinguished one writer from another. It was understanding when and how to utilise these elements of “discourse” (Chatman, 1980) that would allow me to eventually produce stories in a writing ‘voice’ of my own, including 4 ‘Young Adult’ novels that explored identity and belonging while adhering to genres from Mystery (Jackson, 2005b) to Supernatural Suspense (Jackson, 2005a) to Espionage (Jackson, 2006:2007), and a children’s picture book that explored the importance of collaboration through the experience of a group of robots (Jackson & Toniolo, 2011). I would also learn how to apply these elements of discourse to the construction of works of non-fiction including articles, reviews, and text book chapters. Accordingly, I have written more than ten chapters for Jacaranda’s award-winning History and English textbook series, and have created more than 100 online resources for ABC Splash, an initiative of the Australian Broadcasting Corporation and Education Services Australia. Today, I continue to support myself, at least in part, through my writing.

1.1.3 The role of Narrative in my life as a teacher

I began my teaching career in 1999. Over the next decade, I taught at face-to-face schools and at the Distance Education Centre Victoria (DECV), Australia’s largest provider of distance education. It was at the DECV that I honed my skills in writing curriculum materials, with all courses consisting of instructions that had to be accessible for students with a broad range of experience and expertise in the subject area. Not only did this give me an appreciation of the importance of well-written curriculum materials, but I had the
opportunity to work on many cutting-edge projects, including the Centre of Excellence project (2001), the Boys Education Lighthouse Scheme (2004), Do-It-Yourself English (2005-2009), and the development of two online-only modules for the Certificate in Business course which I created alongside other educators from around Australia in 2009.

In the Certificate in Business, the student was presented with 2D virtual office space, within which they could demonstrate their ‘competency’ in topics such as ‘Occupational Health and Safety’. Recognising that these topics were often dry and unengaging for students, I offered to use my writing skills to ‘spice up’ the content a little. A short while later, the student was enrolled in an office where tasks were driven by office politics, and where the teacher took on the role of ‘boss’, a hard taskmaster. As I pointed out to the project’s organisers, creating a sense of cohesiveness between the tasks by setting them in the same narrative ‘world’, giving some of the tasks dramatic stakes, and creating a greater sense of character within the scenario’s emails would not cost a cent more, and might just make the student persist with a task rather than giving up. At the very least, I argued, it might make them smile.

In 2010, I co-founded Comics Go Global, an online, extra-curricular, collaborative Arts-based unit. Designed to be run using asynchronous and synchronous tools including discussion boards and video conferencing, the results of a 4-year pilot were extremely positive (Jackson, Toniolo, & Bitz, 2016), with the clear majority of students successfully engaging in the narrative-driven project. My work on Comics Go Global confirmed, for me, the educational value of exploring educationally-relevant concepts through narrative.

1.1.4 The role of Narrative in my life as a game designer

Between October 2012 and June 2014, I spent most of my time working as co-creator and lead writer on two narrative-based digital educational games. Like many independent game designers, I spent my time divided between writing, managing staff, and negotiating the curriculum. These games were designed to allow year 7 and 8 mathematics students to revise and apply their mathematical knowledge and skills within a consistent narrative context. To engage as many students as possible in the games’ content and immerse them in the world of the story, I designed narratives that leveraged the suspense and intrigue inherent in the espionage genre and which included characters whom I hoped the players would relate to. While the games’ budget did not allow for the creation of multiple storylines, I attempted to give the player the impression of satisfying interactivity by placing challenges at moments of
natural tension, thereby heightening the drama, and ensuring that all mathematical problems 
that had to be solved advanced the player’s understanding of the story, the characters, or both.

When I first applied to undertake a PhD, I planned to use this experience as the basis 
for a mostly personal inquiry into the process of writing such games. However, as my 
research progressed and I stepped away from the game design company that I had co-
founded, using these games as the basis of such an inquiry, and foregrounding my own game 
writing experience over that of other people, seemed needlessly restrictive. I decided, instead, 
to use the challenging experience of writing these games as a springboard to investigate the 
complexities with writing narrative-driven digital educational games from the perspective of 
those working (and writing) on the cutting-edge of digital educational game design 
worldwide.

1.2 Rationale

Despite the overwhelming popularity of digital games amongst teenagers and the 
population at large, many educational games continue to be criticised for their lack of 
entertainment value (Hirumi, Appelman, Rieber, & Van Eck, 2010; Plass et al., 2013; 
Prensky, 2005) or, conversely, for their lack of academic rigour (Gunter, Kenny, & Vick, 
2008; Tobias, Fletcher, & Chen, 2015). In an extensive review of the academic literature 
pertaining to the effectiveness of using digital games for education, Tobias, Fletcher and 
Chen noted that “effective procedures for designing games that produce targeted instructional 
objectives while retaining their entertainment value remain elusive” (Tobias et al., 2015, p. 3). 
They suggested that there appear to be two “cultures” working in game-based research, 
often at cross-purposes, one focused on “fun”, the other on “learning”. Claiming that “finding 
common ground between these two cultures is neither trivial or obvious”, they insisted that 
“both are critical and that integrating the two in search for and development of this common 
ground is significant and worthy of vigorous pursuit” (Tobias et al., 2015, p. 10).

The challenges faced by writers of narrative-driven educational games were aptly 
summarised by Clark Abt, who coined the term ‘serious games’ in 1970. Broadly, the term 
refers to digital applications that are developed to impart learning through games. As 
manager of the Advanced Studies Department of the Raytheon Company Missile Systems 
Division in 1960s, Abt combined his twin interests in systems engineering and creative 
writing to create the drama at the heart of war gaming, a process which would ultimately lead 
him to work instead on arms control and disarmament. Creating these scenarios so that they 
would be suitably compelling and believable was a constant challenge. As he described,
“…So many uncertain factors must be oversimplified and simulated not by exactitudes but by probabilities - that is, with dramatic suspense.” Based upon this assertion, he referred to the ‘role’ that such a person must adopt if he, or she, is going to successfully write such a game: “And it does require creative effort not unlike a playwright’s to design problem situations with dramatic scenarios that best reveal solutions” (Abt, 1970, p. xiv).

In preparation for undertaking the present inquiry, I interviewed four key informants, all of whom are expert game writers, about their experience in writing for the broader games industry and, in some cases, for educational games as well. These experts, whose credentials are discussed further in chapter 3, confirmed the need for educational game writers who are writing narrative-driven games to be well-versed and highly skilled in the use of a range of narrative elements. The experts described some of the reasons that players play games, including challenge, enjoyment, frivolity and immersion, and noted that no single motivator is going to work if that is all a player is offered; it is the balance of these gameplay elements that makes a game fun. The experts also spoke about their own struggles in writing interactive stories, including compensating for branching stories, as well as for players going ‘off-script’, thereby potentially ‘undoing’ many months of work in preparing pre-scripted scenarios which would deliver the same emotional impact to all players.

All these writers – while recognising the challenge of such an outcome – were quick to point out the benefits for players, noting that it is by choosing details such as their avatar’s look, as well as the actions they perform, that gives the player a sense of ownership over the game. They were enthusiastic about the potential for digital educational games to enhance learning, particularly as gaming hardware becomes ubiquitous, and as these games are better able to offer the player a sense of immersion. However, these experts acknowledged the difficulties inherent in attempting to write narrative-driven digital educational games because of the potential conflict between giving players a satisfying learning experience and a satisfying gaming experience.

Despite the complexities associated with writing games that must work mechanically, narratively, and educationally, the educational game design industry today does not appear to place the same emphasis upon good writing that it does upon a well-designed User Experience (UX) and powerful code, or high-quality educational materials. Exploring why this discrepancy exists is beyond the scope of this inquiry, but suffice to say that, until the same attention is paid to the writing process as is paid to other crucial design elements of such games, educational games’ use of narrative will continue to lag behind other game design elements.
Of course, the notion that a game has a single ‘writer’ is not necessarily the case. Some games are written by an individual, while others are written by a team, which may or may not work under the guidance of a narrative designer. Within a highly collaborative team environment, it is also possible to view much of the visual, character, and even audio design as a form of narrative design, further complicating the notion of authorship. In the interests of developing a coherent analysis of the challenges for those who are tasked with writing such games, however, I have spoken to those within a game design team who were responsible for conceptualising the game’s narrative elements as defined by Chatman (1980). This meant that I interviewed the person/s responsible for documenting the events of the game, the characters, the settings, and other narrative elements that would combine to convey the sense of a cohesive ‘game world’. These writers’ work would underpin the creation of visual and audio assets, as well as appropriate gameplay mechanics.

1.3 **Aim**

As I have experienced first-hand, developing compelling digital educational games that successfully incorporate narrative elements requires many decisions to be made throughout the game development process which will ultimately affect the user’s learning outcomes, including their engagement, enjoyment, motivation, and understanding. This thesis is designed to explore the complexities associated with making these decisions by giving ‘voice’ to those who are often silent about the creative and logistical struggles associated with creating such games: the writers. Ultimately, this inquiry is designed to answer the question, ‘How can the writers of narrative-driven digital educational games improve these games’ potential effectiveness using action and textual elements?’ Answering this question requires several sub-questions to be considered:

- What can expert writers tell us about the complex nature of writing for games?
- What does the existing academic literature suggest about the effectiveness of narrative-driven digital educational games as educational tools?
- To what extent do five best practice narrative-driven digital educational games function as action and as text?
- How are narrative elements used, within these games, to promote their learning objectives?
- Does the analysis of the games’ construction, and interviews with their writers, support the validity of the *Games as Action, Games a text* framework (Beavis &
Apperley, 2012) as a way of understanding game design?

In order to address these questions, I have undertaken a critical review to investigate the extent to which narrative-driven digital educational games have been shown to be effective for learning. I have also interviewed the writers of five highly regarded, narrative-driven, digital educational games about their mechanical, narrative, and educational concerns when creating these games. I have analysed these interviews and the games themselves using a framework which allows for the analysis of a game’s totality, including its ‘action’ and ‘textual’ elements (Beavis & Apperley, 2012; Beavis, Apperley, Bradford, O’Mara, & Walsh, 2009). As such, this inquiry represents my attempt, not only as a researcher, but as a writer, teacher, and game designer to reveal the often-hidden complexities associated with creating games that must work mechanically, narratively, and educationally.

1.4 Thesis structure

Prior to undertaking Studies 1 and 2, I interviewed four key informants, all of whom were expert game writers. A ‘key quote’ from each expert has been used at the top of each chapter within this dissertation, including this one. These quotes are not explicitly discussed within the body of the text, but have been selected because they resonate with the ‘theme’ of the chapter, underscoring or challenging some of the ideas that follow. This reinforces the purpose of undertaking the broader inquiry: namely, to foreground the experience of game writers, whose voices are so often silent – or silenced - within the academic discourse on educational games.

Chapter 1 outlines the importance of narrative to me, as a student, writer, teacher, and game designer, and why this led me to decide to investigate the role of the writer in creating narrative-driven digital educational games. Additionally, this chapter includes the aims of the study, and the intended audience for the findings, as well as the thesis outline. Chapter 2 contains a literature review that introduces the broader concepts relating to the potential for Narrative and Play to foster education, and the way that both have changed in response to the advent of digital media. It also outlines the model I have chosen to use when analysing narrative elements in digital games, and reviews literature relating to digital games in general and for games for learning. While this literature review is relatively short, other important questions regarding what is currently known about the effectiveness of Narrative-driven Digital Educational Games has been covered in detail in Chapter 4, where they serve as both a continuation of the literature review and as data within the first of two interlinked studies.
Chapter 3 describes the method and methodology for this study, and offers insight into my research process, which has been heavily influenced by the work of Richardson and St Pierre (2008), for whom “writing is a way of knowing” (p. 962).

Chapters 4-9 represent the Results chapters of this thesis and represent two interlocking Studies. Chapter 4 constitutes Study 1, a critical review of the effectiveness of narrative-driven educational games. In Study 2 (chapters 5-9), each chapter functions as a stand-alone case study, reporting upon one of five narrative-driven, digital educational games, and is structured in a consistent manner, finishing with a discussion of the most significant aspects of the case. These chapters have been constructed by combining interviews with the writers of a game with the analysis of the game they have written, using the classification framework *Games as Action, Games as Text* (Beavis & Apperley, 2012).

Chapter 10 is designed to make sense of the data captured throughout the study by summarising the major themes to emerge from Studies 1 and 2 and relating these to the aims of the thesis. In chapter 11, I offer suggestions for further research in narrative-driven digital educational games, particularly relating to the use of the *Games as Action, Games as Text* framework (Beavis & Apperley, 2012).

### 1.5 Importance of the study and intended audience for the findings

The findings contained within this thesis offer insight into the challenges and opportunities of using narrative in digital educational games, with my observations about the games enhanced by the first-hand accounts of those who wrote these games. It is hoped that this will provide the reader with insight into this complex area, which is at turns personal, theoretical, and practical. This should be of use to those who are conducting research using the *Games as Action, Games as Text* framework (Beavis & Apperley, 2012), as well as those who are researching digital educational games, particularly games that contain a strong narrative component. If the complexity of writing such games can be more fully appreciated by those within the industry, a professional writer might be given the same level of respect within an educational game design team as is currently afforded the designers of the content and the code. The knock-on effect of this, I hope, will be the creation of more engaging, narrative-driven educational games, which have the potential to dramatically improve students’ learning.
CHAPTER 2: LITERATURE REVIEW

The more interactive you make the experience - the more you allow the player with their imagination, with their thoughts, with their actions, to participate in this story and how it plays out - that makes a computer game story more compelling. And the ability to see the results of your actions and know that you’re having an effect in this world that you’re playing in. (C. Avellone, interview, July 1, 2015)

Today, the use of interactive games in Australia is so widespread that, according to PwC’s report *Australian Entertainment and Media 2014-2018* (PricewaterhouseCoopers, 2014), games represented the fastest growing consumer sector of the media in 2013. Digital games come in many forms, span many genres, and appeal to almost as many girls as boys; indeed, since 2005, the proportion of the game-playing population in Australia that is female has risen from 38% to 47% (Brand, Lorentz, & Mathew, 2015). They can be found in arcades, on consoles, on handheld and other mobile devices, online, and on computers. This breadth of games has led to their widespread use in Australia, with the latest figures from the Interactive Games and Entertainment Association (IGEA) (Brand et al., 2015) suggesting that 93% of households have a device for playing games. This number increases to 98% for houses with a family member under 18. The IGEA has shown that young people between the ages of 11 and 15 have the highest proportion of gamers, at 96%, followed by those aged 6-10 (87%) and those aged 16 to 25 (85%) (Brand et al., 2015, p. 11).

Digital games, once maligned within classrooms for their perceived potential to encourage violent behaviour (Anderson, 2004; Anderson & Bushman, 2002) and addiction (Griffiths, Davies, & Chappell, 2004), are increasingly demonstrating their relevance to education. This shift is due, in part, to the perception that such games may engage students for whom traditional learning has been problematic (Squire, 2005; Tobias et al., 2015), and because of their use by adolescents outside the classroom (Silveira, De Araújo Jr, Da Veiga, Bezerra, & Kasperavicius, 2011). When they are effective, such games have the potential to encourage the player to explore, engage in personal meaning-making and play with social boundaries (Shaffer, Squire, Halverson, & Gee, 2005). Connolly, Boyle, MacArthur, Hainey, and Boyle (2012) located 129 articles for a systematic review, focusing on the positive effects of entertainment games, games for learning, and serious games. In their conclusions, the authors reported on empirical evidence establishing the potential for games to promote positive knowledge acquisition/content understanding, and affective and motivational outcomes. Similarly, Jabbar and Felicia (2015), whose work comprised a meta-analysis of 91 articles reporting on empirical studies undertaken between 2003 and 2014 involving students...
aged 8 to 14, noted that “GBL helps students to develop skills and knowledge and strengthens their ability to handle the learning experiences provided by the games”. They suggested that “engagement is related to students’ cognitive and emotional involvement in the gameplay” (p. 767).

To better understand how such games may engage and motivate the player, create a meaningful context for their knowledge and skills, and keep them coming back for more, it is important to understand the socio-cultural importance of story, play, and narrative, and their traditional role in education. Once these have been established, we may consider the arguments for and against using narrative-driven digital games to educate today’s students.

2.1 The importance of Story in society and culture

The significance of stories, according to these and other writers, scholars, and thinkers, both ancient and contemporary, is summed up by Roland Barthes. In considering the importance of story, he wrote, “like life itself, it is there, international, transhistorical, transcultural” (Barthes & Duisit, 1975, p. 237). Neil Gaiman, one of the most highly respected writers of modern times, whose oeuvre spans comics, novels, and films, has likened the behaviour of some of our most pervasive stories to that of a virus: “Stories are ways that we communicate important things, but ... stories maybe really are genuinely symbiotic organisms that we live with, that allow human beings to advance” (Gaiman, 2015:01:58-1:02:15). The belief that stories are fundamental to human nature is shared by Bennet and Royle (2004). They offer five ways of understanding the function of stories: “1) Stories are everywhere; 2) Not only do we tell stories, but stories tell us: if stories are everywhere, we are also in stories; 3) The telling of a story is always bound up with power, with questions of authority, property and domination; 4) Stories are multiple: there is always more than one story; 5) Stories always have something to tell us about stories themselves: they always involve self-reflexive and metafictional dimensions” (p. 52).

According to philosopher Alasdair Macintyre (2013), “man is in his actions and practice, as well as in his fictions, essentially a story-telling animal” (p. 250). He believes that it is only possible for a person to wonder what they should do - which is the central, moral concern of his book Beyond Virtue - if they can understand, first, in what type of story or stories they are participating. For Macintyre, this might mean a temporary situation that a person walks into – a party, for example, or a new job – or even the story of their life itself. Each requires, of the person concerned, behaviours appropriate to “the roles into which we have been drafted” (p. 250). It is in preparing a child for understanding and possibly adopting...
such roles that Macintyre argues for the importance of the fairy tales. Through these tales, of heroes and princesses and wicked stepmothers, he suggests, that we may learn how others may respond to us, and how our responses to them are likely to be construed. Rather than viewing such stories as an escape from reality, Macintyre argues for their centrality to understanding a society: “Hence there is no way to give us an understanding of any society, including our own, except through the stock of stories which constitute its initial dramatic resources” (p. 251).

Throughout his life, Anthropologist Joseph Campbell sought to understand the reasons why myth, which undoubtedly constitutes part of Macintyre’s stock of stories, were so fundamental to human existence. He defined the concept of myth differently at different points of his life, from “the search for meaning” to “the experience of meaning”, to “the experience of life” (Campbell & Moyers, 2011, p. 5). To Campbell, then, myths not only gave the reader/listener access to existential ‘truths’ but allowed them to engage more deeply with life itself:

Throughout the inhabited world, in all times and under every circumstance, the myths of man have flourished; and they have been the living inspiration of whatever else may have appeared out of the activities of the human body and mind. It would not be too much to say that myth is the secret opening through which the inexhaustible energies of the cosmos pour into human cultural manifestation. Religions, philosophies, arts, the social forms of primitive and historic man, prime discoveries in science and technology, the very dreams that blister sleep, boil up from the basic, magic ring of myth. (Campbell, 2008, p. 1)

In 1949, Campbell popularised the concept of a cross-cultural, prototypical myth, which he described as the Hero’s Journey in his influential work *The Hero with a Thousand Faces* (Campbell, 2008). Campbell had found evidence of this Monomyth across the world, in all storytelling traditions. According to Campbell, in the Hero’s Journey, the story’s protagonist, the Hero/Heroine, must undertake a long journey from the ordinary world and into a world filled with danger, where she would be transformed, before returning with the elixir that her ailing homeland required. Campbell viewed the Hero’s Journey as an allusion to the rights of passage, namely: separation, initiation, and return. There were two types of deed that a hero might perform: the physical or the spiritual. The former included things like performing a courageous act in battle or saving a life; while the latter involved learning to cope with the supernormal range of experience and then returning with a message from beyond. What made somebody a hero was her willingness to give her life to something larger than herself.
For psychiatrist and psychotherapist Carl Jung, the “situations” and “figures” (which he referred to collectively as “motifs”) found in mythology were symbolic representations of inner states of being. He referred to them as “archetypes”. Archetypal situations were akin to Campbell’s rites of passage. Archetypal figures included “the shadow, the wise old man, the child (including the child hero), the mother … and her counterpart the maiden, and lastly the anima in man and the animus in woman” (Jung, 1981, p. 183).

2.2 The socio-cultural importance of play

At the turn of the 20th Century, Sigmund Freud (1908) noted that “The child’s best-loved and most intense occupation is with his play or games” (p. 421). For Bettelheim (1987), play permitted the child “… to resolve in symbolic form unsolved problems of the past and to cope directly or symbolically with present concerns. It is also his most significant tool for preparing himself for the future and its tasks” (p. 170).

The importance of play, for children, has long been recognised at a formal, political level within the United Nations and its member States. In 1959, Principle 7 of the Declaration of the Rights of the Child stated that every child must have the opportunity for play and recreation (Assembly, 1959). This was strengthened by Article 31 of the United Nations Convention on the Rights of the Child (UNCRC): “States Parties recognize the right of the child to rest and leisure, to engage in play and recreational activities appropriate to the age of the child and to participate freely in cultural life and the arts” (Unicef, 1989, p. 9). Although the UNCRC remains the most widely ratified treaty in the history of the United Nations, the Committee on the Rights of the Child has criticised States for not taking Article 31 seriously enough. Accordingly, it prepared a General Comment in 2013 in order to raise awareness about the centrality of play and recreation in the lives of children. This General Comment also touches upon the educational role that play can have for a child:

“Play and recreation are essential to the health and well-being of children and promote the development of creativity, imagination, self-confidence, self-efficacy, as well as physical, social, cognitive and emotional strength and skills. They contribute to all aspects of learning; they are a form of participation in everyday life and are of intrinsic value to the child, purely in terms of the enjoyment and pleasure they afford.” (UN Committee on the Rights of the Child, 2013, p. 4)

Play is of crucial importance not only to children but to adults. For the philosopher Huizinga (1949), the instinct to play is a fundamental part of being human. He viewed “Homo Sapiens” (Man the Thinker) as too restrictive a term, and felt that along with the later addition “Homo Faber” (Man the Maker) should be included a third descriptor: “Homo
Ludens” (Man the Player). Rather than attempting to measure and categorise the instinct for play, he asserted that play is inherently irrational, filled with tension, mirth, and fun, and stated: “Play cannot be denied. You can deny, if you like, nearly all abstractions: justice, beauty, truth, goodness, mind, God. You can deny seriousness, but not play” (Huizinga, 1949, p. 3). More recently, Stuart Brown, M.D., founder of the National Institute for Play (U.S.A.), who has engaged in decades of academic and clinical research into play, claimed that:

“[Play] has evolved over eons in many animal species to promote survival. It shapes the brain and makes animals smarter and more adaptable. In higher animals, it fosters empathy and makes possible complex social groups. For us, play lies at the heart of creativity and innovation. Of all animal species, humans are the biggest players of all. We are built to play and built through play.” (Brown, 2009, p. 5)

Brown (2009) asserts that adults should bring this sense of play into all situations, immersing themselves in a constant “state of play” (p. 128). Indeed, in urging adults to find the fun in every part of their lives, Brown suggests that opposite of play is not work; it is depression.

Human beings play in structured and unstructured ways. Our earliest play is often unstructured, with items found at hand, with rules improvised to promote fun and social cohesion. In this way, we learn how the world works, and how friends interact (Brown, 2009). Structured games have existed for millennia, during which time they have taken on many guises, from the athletic games of the Ancient Greeks to board games, card games, children’s games, and – most recently – computer games. For the philosopher Huizinga (1949), one of the defining features of such games is that they are played in a “magic circle” that sets the players apart from the world outside:

The arena, the card-table, the magic circle, the temple, the stage, the screen, the tennis court, the court of justice, etc., are all in form and function play-grounds, i.e. forbidden spots, isolated, hedged round, hallowed, within which special rules obtain. All are temporary worlds within the ordinary world, dedicated to the performance of an act apart. (Huizinga, 1949, p. 10)

Huizinga (1949) defined play as having five fundamental characteristics: it offers the player freedom, is not a part of ordinary, or real, life; is distinct from ordinary life both in its locality and duration; it creates order; it is not connected with material gain (pp. 7-13). In direct response to the work of Huizinga, Caillois (1961) defined play as free from obligation, separate, uncertain, unproductive, regulated, and fictive, containing a fictitious element. He also built upon Huizinga’s work by creating a typology for games which, he suggested,
contained four types of play (Caillois, 1961, pp. 16-26). These were *Agôn* (competition), a "vindication of personal responsibility"; *Alea* (chance), "a negation of the will, a surrender to destiny"; *Mimicry* (simulation or role play), "deploying actions [and] submitting to one’s fate in an imaginary milieu … [and] becoming an illusory character"; and *Ilinx* (whirlpool, or vertigo), "pleasurable torture*. Caillois believed that combining these types of gameplay could achieve different effects with games. He also envisaged them as sitting along a continuum that might be associated with increasing difficulty or decreasing freedom. At one end of this continuum is *paidia*, “diversion, turbulence, free improvisation, and carefree gaiety”; at the other is *ludus*, “arbitrary, imperative, and purposively tedious conventions”.

Although the sorts of digital games that today’s gamers are accustomed to would have been unimaginable in the mid-20th Century, the theories of Huizinga and Caillois remain central to our present understanding of digital games. Indeed, it is these two theorists who Salen and Zimmerman (2004) draw upon in offering their definition of what constitutes a game: “A game is a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome” (p. 83). This definition will serve as the basis for discussion within this study. Salen and Zimmerman elaborate upon this definition, explaining:

The key elements of this definition are the fact that a game is a *system, players interact* with the system, a game is an instance of *conflict*, the conflict in games is *artificial*, rules *limit* player behaviour and define the game, and every game has a *quantifiable outcome* or goal. (Salen & Zimmerman, 2004, p. 83)

2.3 **Defining Narrative**

At first, it might be tempting assume that story and narrative are synonymous, but this is not the case. Narratology, the science of narrative, has borrowed from disciplines as varied as philosophy, anthropology, psychology, literary theory, film theory, and – most recently – game study, or Ludology. Any study that purports to analyse games based upon their narrative structure must, of course, elect an appropriate definition of Narrative. This study will adopt Seymour Chatman’s definitions of narrative elements. In an extension upon the dualist dichotomy between the *fabula* and *sjužet* proposed by the Formalists/Structuralists, Chatman suggested that narrative “… should contain (1) a form and substance of expression, and (2) a form and substance of content” (Chatman, 1980, p. 23). Put simply, “… Story is the *what* in a narrative that is depicted, discourse the *how*” (Chatman, 1980, p. 19). Chatman’s conception of narrative elements, and their relation to a narrative’s form and substance are outlined in Figure 1.
By the mid-1990s, the use of Personal Computers (PCs) and the advent of the Internet was giving rise to new text forms that were fundamentally different from those that had come before. These included hypertext narrative fiction and digital games. Janet Murray’s foundational work, *Hamlet on the Holodeck* (1997), posited a future filled with rich, literary texts in which the “interactors” would walk around, experiencing the fiction first-hand, thereby becoming immersed in the narrative. The move from passive consumers of broadcast media to active participants and producers of interactive media such as games could be seen as a move from readerly texts to writerly texts. According to Barthes (1974), “readerly” texts leave no room for interpretation and support the status quo, while “writerly” texts are open to interpretation or “re-writing”.

It was the role of the player as active participant that led to a public debate between Ludologists and Narratologists. Between 1999 and 2005, as theorists from both ‘sides’ of the debate attempted to define the landscape and carve out their own niche in this growing area. Inspired in part by Murray’s vision, narrative theorists (Atkins, 2003; Bolter, 1991, 2001) offered their analysis of these new texts using the tools at their disposal, those of literary and film analysis. While the work of film theory and the understanding of film offered those studying games a range of analytical tools, there were also clear examples of where adopting the language of another area of study may be unhelpful, such as pigeon-holing games based on genres that were better suited to film (Apperley, 2006).

![Figure 1. A Diagram of Narrative Elements (Chatman, 1980, p. 26)](image-url)
In 1998, Gonzalo Frasca acknowledged that much of the emerging theory about computer games was found within different disciplines, and proposed the establishment of a new discipline to study such games (Frasca, 1999). It would be called Ludology, from the Latin *Ludere*, meaning “to play”. Well-known Ludologists of this era included Gonzalo Frasca, Markku Eskelinen, Jesper Juul, and Espen Aarseth. One of the key distinctions that these scholars sought to make was that games were defined not by their stories, but by player action/interaction, as can be seen in this foreword to *Game Studies*, the International Journal of Computer Game Research, the first journal of its type:

Games are both object and process; they can’t be read as texts or listened to as music, they must be played … Yet much of the industry and the academic commentators see the need for “narrative” structures in order to understand games and make games ‘better’. (Aarseth, 2001, p. 2)

In the years that followed, these and other Game Studies scholars, many of whom identified themselves as Ludologists, questioned whether games should be viewed through a Narrativist’s lens (Frasca, 1999; Juul, 2000, 2001; Pearce, 2004). Some expressed strong concern at the prospect that the study of games was being subsumed by theorists from other disciplines including narrative and film theory (Eskelinen, 2001) through a process of “theoretical imperialism” (Pearce, 2004). However, many within the Narratology community realised that these theoretical frames would be insufficient to explore the unique aspects of games moving forward, and might result in what Flanagan called “linguistic muddling” (Pearce, 2004). Aware of the debate surrounding the use of these frames to analyse games, Jenkins (2004) suggested that it might be more appropriate to view games not as “stories”, but as “spaces ripe with narrative possibility” (p. 119).

In 2003, Frasca attempted to clarify or perhaps soften many of his own positions (Frasca, 2003), aligning them more closely with those of Narratologists. He pointed out that many of his fellow Ludologists had called for narrative to be considered alongside game mechanics from the start, a claim that can be verified by reading the literature of the time. He even suggested that this debate never took place. By 2005, the debate – such as it was - had run its course, and representatives from both sides had publicly made peace, vowing to find common ground (Frasca, 2003; Murray, 2005). This more inclusive approach to the study of digital games has taken root in the intervening years, as the field of Game Studies, and the analysis of games themselves, have broadened and become more nuanced. This has allowed issues that might otherwise have been obscured to be explored more fully. These include the narrative and ludic nexus of games (Brand, 2005); the appropriateness, and effect, of using
genre to classify games (Apperley, 2006); and how games might function both as “action”, and as “text” (Beavis, O’Mara, & McNeice, 2012).

Chatman’s (1980) definition of Narrative, including the bipartite structure of “Story” and “Discourse”, was created within the broadcast paradigm, and views the relationship between author and audience as one of transmission and reception, rather than transmission and reception/interaction. In fact, it was published six years before Nintendo released *The Legend of Zelda™ (1986)*, which sought to push the boundaries of storytelling for mainstream games. As such, he would presumably have had little sense that games would become one of the dominant storytelling forms of the 21st Century, which explains why they did not rate a mention within *Story and Discourse* (Chatman, 1980). Despite this oversight, Chatman’s model continues to be applied to the study of texts of all types today. This is due, in part, to Chatman’s belief that narrative elements work both within and across text types, or “manifestations”, making his conceptions of “Story” and “Discourse” flexible enough to be applied to digital games.

2.4 Chatman’s narrative elements applied to traditional and interactive texts

2.4.1 Events

According to Chatman (1980), an event is any physical or mental action that contributes to the reader’s understanding of what happens in the narrative. When a character is the agent of an event, the event may be considered an action; when an event happens to the character, it is regarded as a happening. In a digital game, it is up to the player to determine which option they will take from those presented, which directly influences the actions and happenings that constitute the events of the story.

2.4.2 Characters

If an action is brought about by an agent, or affects a patient, and is plot-significant, the agent/patient should be considered characters. The principal actions that a character can perform or experience are non-verbal physical acts, speeches, thoughts, feelings, perceptions, and sensations. Characters may be actors in the story and/or narrators of it. A narrator may be overt, as in a character who is clearly taking part in the story they are now conveying to an audience. A narrator may, instead, be an intrusive outside party who, while not participating in the story proper, still has enough knowledge about it to be able to tell the audience about it. Where the narrator of a story is not identified, and there is no trace – no matter how minimal
that the story is being told, the text could be said to be “nonnarrated” or “unnarrated”.
Digital games may contain an overt narrator, or they may not; however, it is in examining
character that one of the major differences between games and their more traditional
counterparts can be seen. Here, instead of witnessing the events of the story through the eyes
of somebody else, whose life cannot be influenced by the presence of the reader, the player is
granted the ability to control the actions of at least one character. It is through this avatar that
the player will affect the game world in small or large ways.

2.4.3 Setting
Setting is “any evocation of place” (Chatman, 1980, p. 25), and may include a
physical setting, or an internal place, such as a memory. In an audio/visual text, such as a
digital game, the setting can be illustrated using constructed elements such as sets and props,
as well as lighting and sound effects. Where it is not possible to show all the implied story
space, the reader/player will need to infer, or imagine, what exists beyond the edges of the
frame. Often, the setting contributes not only to locating the narrative in space and time but to
establishing the mood.

2.4.4 Structure
A writer has an almost infinite number of events from within the “story” from which
to choose when constructing the narrative. Therefore, he/she will choose those that give a
sense of continuum; and will leave the audience to fill in the blanks. The audience does so by
referring to what they know about the way that the real world works, as well as to what they
know about the workings of this fictitious world based on what they have already
experienced of it as well as of texts of this type. Chatman refers to events that are “logically
essential” to the functioning of the plot as “kernels”; he refers to events that are not essential
to the plot as “satellites”. In digital games, notable plot structures include branching/non-
branching stories; and single versus multiple endings.

2.4.5 Point of view
Traditionally, there are some different ways in which the reader/viewer might be
invited to witness the events of a narrative, and to understand their significance. This is often
achieved by giving the reader/viewer access to a person’s point of view. This person may
have a complete understanding of all the events or only a partial understanding; they may or
may not be the narrator. Because it is often easiest to relate to a character whose point of
view one has been invited to share, the point of view character is often the protagonist of the story. While the protagonist of a novel, film, or other work of fiction tends to be somebody on the page/screen whom the reader/viewer is invited to share the point of view of, in digital games it is more typical for the player themselves to take on the role of the protagonist. Because of this, they are given direct access to this character’s perceptions, cognitions, attitudes, emotions, memories, and fantasies.

2.4.6 Time

In traditional texts, there is a distinction between the events as they are experienced by the characters in the story and as they are experienced by the reader/viewer. In games, which rely on character interaction to drive the story forward, the present moment for the player is usually the same as the present moment in the life of the character, known as the “character-NOW”. Even though these two ‘presents’ are unified within games, however, the player’s perception of story-time can still be manipulated to achieve dramatic effects. According to Genette (1983), these manipulations relate to the “order”, “duration”, and “frequency” of events.

2.5 Understanding games for learning

In 1996, the New London Group created A Pedagogy of Multiliteracies: Designing Social Futures, their “manifesto” (Cope & Kalantzis, 2009), which sought to address the changing nature of literacy in an increasingly globalised and technology-rich society. The group insisted that it was time for our definition of literacy to change from focusing on a student’s ability to understand and create predominantly print-based texts, to fostering an appreciation for the consumption and creation of multimodal texts; that is, texts presented in a range of ‘modes’ that make use of ever-changing information and multimedia technologies. This process would require students to develop “multiliteracies”.

The New London Group suggested that, within this ever-changing landscape of text consumption and creation, “language and other modes of meaning are dynamic representational resources, constantly being remade by their users as they work to achieve their various cultural purposes” (Cazden et al., 1996, p. 64). Games are rich multimodal texts (Apperley & Walsh, 2012; Beavis & O’Mara, 2010; Beavis, 2014; Beavis et al., 2012; Evans, 2004; Steinkuehler, 2010; Walsh & Apperley, 2009), in which more than “nontrivial effort” (Aarseth, 1997) is required allow the reader to interact with the text. As such, they represent what Aarseth (1997) termed “ergodic” texts, the term a portmanteau constructed from the
Greek words ergon and hodos, meaning ‘work’ and ‘path’. Like a film, many games utilise audio design, including music and sound effects, as well as casting in the form of character design, lighting, camera angles, and the composition of props and other visual elements, to help define their tone and genre. Most games contain spoken and sometimes written language, which is complemented by visuals and audio, forming a rich, ever-changing semiotic tapestry which the player must not only be able to ‘read’ as a passive audience member might in a cinema, but to ‘write’ as they participate in making choices that will allow them to progress through the game, a process that Beavis & O’Mara (2010) refer to as “multimodal creativity” (p. 74). Another multimodal aspect of games are the “paratexts” that spring up around them (Consalvo, 2007), created by the game designers/publishers as support or extension materials, or by game players themselves in forms as varied as “reviews, websites, forums, magazines, walk throughs, cheats, Machinima and more” (Beavis & O’Mara, p. 74).

As will be shown in Study 1, both narrative-driven digital mainstream games and those created specifically for educational purposes have the potential to foster learning in the form of enjoyment, engagement, content and skill acquisition, and even attitude and behaviour change. Before examining the empirical evidence for ourselves, however, it is appropriate to consider some of the conclusions drawn by other researchers in the field of game theory, particularly in relation to examining why, when, and how these do or do not work. Examining meta-analyses, systematic and critical reviews of the scientific literature reveals a field in flux: publications are proliferating quickly (Boyle et al., 2016), yet there are suggestions of publication bias (Sitzmann, 2011), while the standards for study design and measurement continue to present problems for those who wish to compare cases (All, Castellar, & Van Looy, 2013; Ke, 2009; Tobias, Fletcher, Dai, & Wind, 2011; Young et al., 2012; Young, Slota, & Lai, 2012). Understanding the theory behind the educational value of games, as well as considering the contexts and purposes for which they are unsuitable, is key to making their use within the classroom as successful as possible.

2.5.1 Games and knowledge/skills acquisition

James Paul Gee, one of the world’s foremost educational game researchers, has identified thirty-six good learning principles that are incorporated into good games. The broad strokes of his argument outline some of the best features of digital games and their value for learners. Gee (2003) highlights games’ ability to operate at a level that is challenging but just achievable, a concept that is akin to the zone of proximal development
(Vygotsky, 1978). This desirable challenge to difficulty ratio is key to achieving “flow” (Csikszentmihalyi, 1997), a state of spatial immersion in which the participant loses all sense of time as they engage fully in a given activity. “Good games” offer the player/learner information on demand, just in time, and within a context they can relate to. They present problems in a logical order, and allow the player to develop increasingly sophisticated skills through an ascending process of challenge and mastery, a process that he likens to the development of expertise in any domain.

Vogel, Cannon-Bowers, Bowers, and Wright (2006) evaluated 32 studies and concluded that the use of interactive games and/or simulations led to significantly higher cognitive gains and better attitudes toward learning when compared with traditional methods of learning. These benefits did not appear to be affected by gender, the age of the player, or whether the players played on their own or with others. Ke (2009) undertook a qualitative meta-analysis, and revealed that 34 out of the 65 studies within the review reported significant positive effects of computer-based games, compared with 17 which reported mixed results, 12 which reported no difference between computer games and conventional instruction, and 1 which reported that traditional teaching methods had been shown to be superior in achieving learning outcomes. Similarly, Papastergiou (2009) conducted a critical review of the empirical evidence on the use of games in health and physical education, and concluded that electronic games have the potential to improve players’ knowledge, skills, attitudes and behaviours (including fitness) in relation to health and physical exercise. Papastergiou also noted the potential for these games to foster collaboration and teamwork both in the local context, through multiplayer modes, and in the global context, through online “affinity groups”, groups of likeminded individuals which Gee (2000) suggests share “allegiance to, access to, and participation in specific practices” (p. 105).

By contrast, Clark, Yates, Early and Moulton (2010) examined numerous sources, including meta-analyses, analysing over 50 years of research, and concluded that educational media, including games, have not and will not influence motivation, learning, or work performance. They also claimed that discovery learning, which forms the basis of educational philosophies including constructivism and problem-based learning, as well as game design, produces less effective learning outcomes and motivation than guided instruction. While the authors acknowledged that students often report high levels of motivation while playing digital games, they suggested that these claims were unreliable, since they were based upon subjective ratings, and may not lead to improved educational outcomes. Sitzmann (2011) conducted a meta-analysis of published and unpublished studies from 1976 to 2009 from 65
independent samples and more than 6,000 trainees, and revealed that those taught via games scored higher on post-training self-efficacy, declarative knowledge, procedural knowledge, and retention than those taught using traditional methods. However, while simulation participants learned more than colleagues undertaking passive training in the same material, they learned less than colleagues undertaking more active (but not simulation) training.

Reflecting the ongoing debate about the effectiveness of digital educational games, throughout 2012 two research teams held a public debate via a series of published articles. Young et al. (2012) synthesised 39 articles and found some evidence for video games’ effectiveness in Language Learning, History, and Physical Education, but not in Science or Mathematics. In response, Tobias and Fletcher (2012) offered their own findings from an earlier review of much of the same literature (Tobias et al., 2011), in which they had established that games were effective for near and far transfer so long as there was a high degree of overlap between these external tasks and those undertaken within the game. They also criticised Young et al.’s findings on the subject areas of Science and Health for failing to report some empirical studies that had reported positive results. Young et al. (2012) responded by suggesting that, in large measure, they would add their support to the comments of Tobias and Fletcher, and suggested that the findings of both teams underscored the importance of defining operational definitions of key gaming research terms, including game features and mechanics, and narrative structure, to allow for the more accurate comparison of results.

Two systematic reviews, conducted by members of the same team four years apart, provide some insight into the way that game research has changed over time. Connolly et al. (2012) examined the literature on computer games and serious games, looking for potentially positive impacts in students aged 14 years or above. In a review of 129 papers focusing on games designed primarily as educational tools as well as COTS games, 70 of which they deemed to have been of higher quality, they found that playing computer games is most frequently linked to knowledge acquisition and content understanding, as well as affective and motivational outcomes. Within this sample, the authors revealed that COTS games could be effective for the development of transversal competencies such as visual perceptual skills which can then be applied to a range of school subjects. Boyle et al. (2016) updated Connolly et al.’s (2012) review of the empirical evidence of the impacts and outcomes of computer games and serious games, focusing on 143 higher-quality studies, and found the most common use of games was in STEM subjects and Health. They pointed out that, since the
original study had been undertaken, there had been a move away from using COTS games in the classroom due to a lack of alignment between their goals and those of the curriculum.

### 2.5.2 Games for engagement and motivation

When seeking to understand what is meant by engagement in games, Boyle, Connolly, Hainey, and Boyle (2012) considered a wide range of factors, including “subjective experiences while playing games, the physiological concomitants of these experiences, motives for playing games, game usage and time spent playing games and the impact of playing on life satisfaction” (p. 771), and asserted that enjoyment was a key factor in engagement and motivation, since over time the enjoyable feelings experienced while playing games led to positive attitudes towards playing games.

After undertaking cross-genre research, Lazzaro proclaimed that “without emotion there is no game” and contended that “emotion is essential to maintain player focus, make decisions, perform, learn, and enjoy the process of play” (Lazzaro, p. 156). According to Lazzaro, for a player to become emotionally engaged by a game they must be having fun, which she rates as more important than many other aspects of game play including high-quality graphics. The ‘4 Keys 2 Fun’, according to Lazzaro, are Hard Fun, Easy Fun, Serious Fun, and People Fun. When a player is having fun, it is because the game’s design uses these four ‘fun keys’ to promote Fiero, or personal triumph over adversity; curiosity; relaxation and excitement; and amusement. According to Lazzaro, fun appeal transcends game types and genres. Another proponent of the essentiality of fun in game play is Koster (2013), who places learning at the centre of his definition of fun. He suggests that fun is “… the feedback the brain gives us when we are absorbing patterns for learning purposes” (Koster, 2013, p. 96).

Wouters, Van Nimwegen, Van Oostendorp, and Van Der Spek (2013) conducted a meta-analysis of the cognitive and motivational effects of serious games, using a broad sample of studies, in which games were tested in the laboratory and in classrooms. Within this meta-analysis, the researchers attempted to discern the instructional and contextual factors that might moderate effectiveness. They found that serious games were more effective for learning and retention, but less motivating, than conventional instructional methods. They also found that the learning effects of serious games benefited from the use of other instruction methods, multiple training sessions, and players working in groups.

Abdul Jabbar and Felicia (2015) sought to uncover how engagement is characterised in both digital and non-digital games, and how engagement can affect learning. The authors
analysed 91 papers published between 2003 and 2013 which provided empirical evidence of the connection between engagement and learning in digital educational games when used with students aged 8 to 14. Although flaws in the data, including insufficient data on study participants and game conditions, which made analysing effect sizes of variables impossible, the authors concluded that most of the 91 studies showed that gaming could assist students in developing knowledge and skills, and could strengthen their ability to handle the learning experiences offered by such games. The authors also asserted that engagement relates directly to how involved the student feels in the game, both cognitively and emotionally. They suggested that two ways to achieve this involvement are through role-play and story, a process which is described in the following section.

2.5.3 Games and Narrative

Gee (2011) has written about the role of narrative in games, including – but not limited to – games for learning. He argues that, by walking in the shoes of the story’s central character, the player can develop empathy as well as the ability to reflect critically upon their behaviour in real life. In this process, Gee suggests, the barrier between reality and fantasy is highly porous: “real life spills into the game and … the game spills into real life” (Gee, 2011, p. 355). For Rieber (1996), this type of “fantasy” is key to engaging a player in a game designed for learning, but he drew a clear distinction between the effectiveness of “exogenous” and “endogenous” fantasies in this regard. Exogenous fantasies, he pointed out, are often used unsuccessfully in educational games, because they act as little more than “sugar coating”. By contrast, games that employ endogenous fantasies provide a meaningful context for the game’s challenges, blurring the line between the game and the learning material beneath.

Abdul Jabbar and Felicia (2015) investigated the link between engagement and two separate variables: role-play and narrative. A number of studies within their review suggested that role-play was an effective way of achieving immersion in the game, and that by playing the role of another person within the game students were better able to develop a sense of responsibility. Of the nine studies which addressed the use of narrative, the majority found that narratives helped students to relate to the situations and characters depicted in the game, which led to higher levels of understanding and the motivation to complete a greater number of missions, and referred to narrative’s potential to grab and hold the player’s attention, increasing their engagement with the learning materials and making tasks seem less boring,
while two studies suggested that narrative did not contribute the students’ learning or enjoyment of the games.

Clark, Tanner-Smith, and Killingsworth (2016) conducted a meta-analysis to investigate the effectiveness of digital games on learning outcomes in game versus non-game conditions and using augmented versus standard game designs. While they concluded that digital games significantly enhanced learning within both comparison groups, their assessment of the value of narrative within games was less positive. Their findings indicated that games with no story or thin story depth (only setting, scenery, or context) had significantly larger effects relative to those with medium story depth (involving some evolving story over the course of the game), the lack of games with thick story depth in their study (n=5) made it difficult to reliably judge their effectiveness. Perhaps surprisingly, the researchers also discovered that there was a significant negative relationship between contextualisation (the use of immersive visual and narrative techniques) and learning outcomes. While these results may at first seem discouraging for those who wish to create more immersive games for learning, the researchers pointed out that no meta-analysis can account for all possible design approaches or qualities of implementation, and suggested that future research should not be limited to the highest-performing game characteristics identified within this study. They singled out visual and narrative contextualisation in this regard, but reiterated that their meta-analysis had identified some of the potential challenges for game designers.

To date, only one systematic review has been undertaken specifically investigating the effectiveness of using storylines within digital learning materials. Elena Novak (2015) located more than 70 articles, reports, dissertations, books, and conference presentations relating to the use of storylines, narrative, fantasy, or story structure in such materials, and deemed 11 to be suitable for synthesis. Within this relatively small sample, Novak found mixed results for storyline-related instructional effectiveness, with several studies suggesting that including a storyline either decreased or had no effect on learning, while one experimental study with elementary students showed positive storyline learning outcomes.

While these findings are intriguing, the studies included in Novak’s review were restricted to those containing both control and experimental groups, and were selected from a period of approximately thirty-five years, with four of the resources profiled being published between the early 1980s and the late 1990s. The studies were not restricted to those focusing on games. As such, there is still a need to critically review the empirical evidence on the
effectiveness of narrative-driven digital educational games. This gap in the literature has been addressed in Study 1.

### 2.5.4 Establishing a climate for educational success

For educational games to have the desired effect upon learners, several factors need to be addressed, including making sure that teachers are willing to take on the role of “facilitator” for the game (Egenfeldt-Nielsen, 2007) and that schools can support teachers in adopting this change in practice, particularly during this learning process (Stieler-Hunt & Jones, 2015). Other challenges inherent in using digital games effectively within the classroom include the costs associated with making games for learning accessible to students with accessibility issues (Torrente, Del Blanco, Moreno-Ger, Martínez-Ortiz, & Fernández-Manjón, 2009); the amount of class time and equipment needed to allow students to adequately explore the game, as well as inadequate support materials for teachers and questions around the appropriateness of game content for school students (Kirriemuir & McFarlane, 2003); and the fact that digital games hold a privileged place in students’ lives, which teachers may undermine when “turning it into school” (Beavis, 2014, p. 435).

For narrative-driven digital educational games to have a meaningful impact upon students, they must straddle the often-disparate aims of education and entertainment. This represents a major challenge for the game design team, including the writer (Dickey, 2006b; Hirumi et al., 2010; Prensky, 2005; Rieber, 1996; Rieber & Noah, 2008; Scardamalia & Bereiter, 1991; Wechselberger, 2009). In his book *Character Development and Storytelling for Games* (2014), academic and game creator Lee Sheldon states: “What we know as writers of games is that the *intent* may be serious, but the *experience* must be as engaging and surprising and exciting as the best commercial games with nothing on their minds except fun” (2014, p. 488). This inquiry is dedicated to exploring the complexities for writers who must try to make these games work mechanically, educationally, and narratively.
CHAPTER 3: RESEARCH METHODOLOGY

You have to have a philosophy. So, what I’ve been talking about, this is my philosophy. These are not your rules, these are not rules for you, these are not guidelines and paradigms. As I said, if people do have them, be cautious. This has been my journey, and my experience wrestling with these things over many decades.
(M. Costello, interview, March 19, 2015)

The Narrative Inquiry that lies at the heart of this thesis was undertaken to answer the question ‘How can the writers of narrative-driven digital educational games improve these games’ potential effectiveness using action and textual elements?’ To fully address this question, several sub-questions have been addressed:

- What can expert writers tell us about the complex nature of writing for games?
- What does the existing academic literature suggest about the effectiveness of narrative-driven digital educational games as educational tools?
- To what extent do five best practice narrative-driven digital educational games function as action and as text?
- How are narrative elements used, within these games, to promote their learning objectives?
- Does the analysis of the games’ construction, and interviews with their writers, support the validity of the Games as Action, Games a text framework (Beavis & Apperley, 2012) as a way of understanding game design?

Providing answers to these sub-questions has required two interconnected research studies to be undertaken. The first is a critical review of the academic literature regarding the effectiveness of narrative-driven digital educational games. The second is an analysis of five games which represent best practice in this burgeoning area of game design. These studies illustrate both what is known about the educational effectiveness of narrative-driven, digital educational games, and what is yet to be fully appreciated about designing such games. This chapter provides a rationale for, and overview of these studies, while both the final sub-question and the greater research question that underpins this inquiry will be addressed in the concluding chapter of the thesis, where the findings from Study 1 and 2 feed into recommendations regarding the design of best-practice narrative-driven digital educational games.
3.1 Overarching methodology: Narrative Inquiry

In their ground-breaking work on Narrative Inquiry, Connolly and Clandinin (1990) stated that “… people by nature lead storied lives and tell stories of those lives, whereas narrative researchers describe such lives, collect and tell stories of them, and write narratives of experience” (p. 2). Given Narrative Inquiry’s “focus on experience and the qualities of life and education” (Connelly & Clandinin, 1990, p. 3), it is perhaps not surprising that it quickly became a popular form of conducting research within education.

Building upon earlier work in the field, Clandinin, Pushor and Orr (2007) offered 3 “commonplaces” which they argued should be considered by those conducting Narrative Inquiry. These were “temporality, “sociality”, and “place” (p. 23). Temporality refers to the notion that events, people and places must be understood as having a past, present and future, and being always in transition. Sociality refers to the personal and social context for both researcher and participant, as well as the relationship between them. Place refers to the physical space in which an inquiry takes place, and asks the researcher to consider how this place (or places) may impact upon the findings.

Within Narrative Inquiry, the notion of what constitutes appropriate writing for research is very broad, with conventional understandings actively challenged by its proponents. This has opened the door for understanding the role of the writer differently as well. Structuralism, which dictated the form and content of academic writing in the social sciences until the late 20th Century, expected writing to be either “literary”, which could be creative and subjective, or “scientific”, which was factual and objective (Marcus & Clifford, 1985). Accordingly, researchers in the social sciences, following in the footsteps of the scientists of old, were expected to abide by the same rules, writing in plain language and attempting to remove themselves and their own experience from their writing where possible.

For Poststructuralists, a researcher’s identity, or subjectivity, is regarded as essential to understanding the purpose of the research and its findings (Richardson & St Pierre, 2008). Because research is conducted by a specific person at a certain place and time, the research, and indeed the researcher, will be impacted by multiple and competing discourses. Richardson and St Pierre suggest that, to assume that any single way of viewing the world is true or should be preferred over all others, is arrogance; instead, they suggest that the reader should regard all findings with the same degree of scepticism. They encourage the researcher to recognise that their own subjectivity is “shifting and contradictory – not stable, fixed, and rigid” (Richardson & St Pierre, 2008, p. 962). They give the researcher permission to release themselves from the censorious hold of science writing.
Since its earliest incarnation, however, the proponents of this branch of qualitative research have urged practitioners to ensure that they maintain rigour when conducting, analysing, and reporting upon their research to ensure that it is more than just “telling stories” (Clandinin et al., 2007). Loh (2013) notes that many who embark upon Narrative Inquiry are regularly queried on its rigour and quality. To ensure that such a study’s findings can be justified, he suggests, its author/s must attend to “issues of trustworthiness, narrative truth, verisimilitude, and utility” (p.1). Loh builds upon this claim by offering the researcher several questions to ask themselves in relation to their work:

How valid is this narrative approach? How valid is the analysis of the data? How valid and reliable is the collection of these “stories,” and how can a story be valid as an analysis? If the data is collected through the participants’ telling of their “storied experiences,” how do I know if they are being truthful? What if they made up a story or embellish the retelling? Will the research be valid then? (Loh, 2013, p. 2)

To address these questions, I have adopted a standard framework (Beavis and Apperley, 2012), which I have defined and elaborated upon to make it appropriate for analysing interview data. By standardising my analysis in this way, by describing my observations thickly, and by quoting my interviewees liberally, I have sought to offer “detailed accounts of experience” (Connelly & Clandinin, 1990, p. 11). Because three of the five cases depicted within Study 2 involve more than one writer, it is possible to assess the trustworthiness of a statement by comparing it to the experiences of others within the same game design team. As a final check, findings about the challenges and opportunities for the writers of narrative-driven digital educational games are not drawn not from a single interview, but from the cumulative evidence provided by all five cases. These findings are then compared to the findings from analysing the games themselves to reach solid conclusions.

My journey of inquiry culminates in several observations and recommendations pertaining to the would-be game writer, in which I articulate how what I have learned through undertaking Studies 1 and 2 might be used to enhance the writing of narrative-driven digital educational games. I write these things not just as a researcher, but as a writer myself of both traditional and interactive fiction, including games. As such, my dissertation represents a Creative Analytical Process Ethnography (Richardson & St Pierre, 2008), in which the writing process and the eventual or implied product are deeply and authentically intertwined.
3.2 Method

3.2.1 Pre-Study interviews: Leveraging the experience of Key Informants

Prior to undertaking Studies 1 and 2, I interviewed four key informants, all of whom were expert game writers, about their experience in writing for the broader games industry. The questions used in these interviews are provided in Appendix A. Experts are typically chosen for study not because they represent themselves as a single case, but because they are representative of a larger group (Flick, 2009). I believed that these experts’ experience might illuminate some of the key struggles that writers face in this medium, and some of the strategies that can be used to address these, which could then inform the interviews with the writers of narrative-driven digital educational games.

I used purposive sampling to locate suitable key informants. Also referred to as “judgmental” or “expert” sampling, purposive sampling allows the researcher to apply expert knowledge to make a non-random selection of people who they believe represent a cross-section of the population (Lavrakas, 2008). In this case, I used my judgment to choose writers who I felt would adequately represent views on the challenges and opportunities of writing digital games. Each writer had credits on published works, including games, and had given public lectures and interviews about narrative and games, and was selected on the basis that he or she should be able to provide complementary but distinct advice on narrative in games from the other experts. Key informants were also chosen on the basis that they felt comfortable talking openly about some of the projects they had worked on. Gender balance was not deliberately sought in recruitment for these interviews; therefore, only 1 of the Key Informants was female, while 3 were male. Of the four experts chosen, two had worked on educational games. This does not reflect the broader use of professional writers within educational game design, however, since I approached both Matthew Costello and Nick Fortugno in part because I was aware of their experience in this educational games and was interested in seeing how they might regard writing such games given their broader writing experience.

At the time of recruitment for this study, I had access to large numbers of games industry experts through the social network LinkedIn, via publicly accessible LinkedIn groups, such as the Serious Games Society and the Independent Game Developers’ Association (IGDA) Game Education Special Interest Group. After identifying a suitable candidate based upon their game credits, I made contact via InMail (a LinkedIn email), explaining the project in general terms to gauge their interest in participating. When a
potential key informant was interested in participating in the study, I sent them a plain language statement and consent form (Appendix B). Once this was signed, the expert was welcomed formally onto the study, and a time was arranged to ‘meet’ via Skype or, where possible, in person.

The resulting conversation was conducted as a semi-structured interview. Conceptually located between the totally predetermined questions of a structured interview and the spontaneous, free-flowing conversation of an unstructured interview, the semi-structured or in-depth interview relies upon some adherence to a list of questions or “theme list” drawn up by the researcher, but allows the interviewee to express their views in their own words (Esterberg, 2002) and for emergent themes to be explored as the researcher sees fit. According to Drever (1995), semi-structured interviews are ideal for small-scale research such as a case study, because – while the discussion may follow a general, pre-conceived pattern – it can be altered or guided by the interviewee, something that may not be possible or even desirable in a larger study. Interviews with key informants were designed to be “theory-generating”, in that they were geared towards eliciting information about each writer’s creative process that would allow for the generation of a theory about the challenges and opportunities of writing for digital games, as well as some strategies for achieving success. The writers selected as key informants were Veronika M. Megler, Matt Costello, Nick Fortugno, and Chris Avellone. The views they expressed to me and are reported in this thesis are their own, and do not necessarily reflect the views of the companies they have worked for.

Veronika M. Megler was just about to graduate from a Bachelor of Science at the University of Melbourne, and was in her early twenties, when she was asked to co-write *The Hobbit* (1982). One of the first dungeon-crawlers, this game would go on to sell more than a million copies, cementing its place in the early history of video games, and Megler’s place as a pioneering writer in what was then an emerging medium. In the intervening years, she has completed her PhD in Computer Science at Portland State University, working with Dr David Maier in the emerging field of “Smarter Planet” and big data (Megler & Maier, 2012). Megler now works for Amazon Web Services in the U.S. as a Senior Consultant in Big Data and Analytics. At the time of writing, she had published more than 20 industry technical papers and 10 research papers on applications of emerging technologies to industry problems, and held two patents, including one on her dissertation research. Her interests include applications of emerging technologies, big data and analytics, scientific information management and spatio-temporal data.
Matt Costello’s award-winning work, across all media, has meshed story, gameplay and technology. His acclaimed horror novel *Beneath Still Waters* was filmed and released by Lionsgate world-wide. His novel, *Vacation*, was a major 2011 release from Macmillan/St. Martin’s Press, and the sequel, *Home*, was published in 2012. *Vacation* was optioned for film, to be shot in Costa Rica, in late 2015. In 2014, St. Martin’s/Macmillan released the SF epic novel, *Star Road*, co-written by Rick Hautala. Costello’s children’s books include the series *The Kids of Einstein Elementary* (Scholastic) and *Magic Everywhere* (Random House). His games for children include the award-winning *Aladdin’s Mathquest* and *Hercules*, both for Disney, as well as major games for Scholastic and PBS. Matt has scripted episodes and created TV formats for PBS, Disney, and the SyFy channel. He consults on story, games and multiplatform projects around the world, and has also created interactive installations for The British Museum, Disney and, with Neil Richards, for Buckingham Palace. He has written and designed dozens of award-winning and best-selling games including *The 7th Guest*, *Doom 3*, *G-Force* and *Pirates of the Caribbean*. He scripted and created the game world for Id’s major release on all platforms, *Rage*, and wrote the Random House novel based on this game.

Nick Fortugno is a game designer and entrepreneur of digital and real-world games based in New York City, and a founder of Playmatics, a game development company. Playmatics has created a variety of digital and real-world games for organisations including the iOS game *Red Bull Focus*, AMC (such as the CableFAX award winning *Breaking Bad: The Interrogation*), Disney, the Corporation of Public Broadcasting, the Federal Reserve Bank of New York, and the Red Cross/Red Crescent. For the past ten years, Fortugno has been a designer, writer and project manager on dozens of commercial and serious games, and served as lead designer on the downloadable blockbuster *Diner Dash* and the award-winning serious game *Ayiti: The Cost of Life* (2006). He is also a co-founder of the *Come Out and Play* street games festival hosted in New York City and Amsterdam since 2006, and co-creator of the *Big Urban Game* for Minneapolis/St. Paul in 2003. Nick teaches game design and interactive narrative design at Parsons: The New School of Design, and has participated in the construction of the school’s game design curriculum. Some of Fortugno’s writing about games can be found in the anthology *Well-Played 1.0: Video Game, Value, and Meaning*, published by ETC-Press.

Chris Avellone started his career by freelancing for a few Pen and Paper Role-Playing game companies in high school before Interplay hired him as a game designer in 1996. He worked on most if not all Black Isle’s internally developed projects, including *Planescape: Torment* (Lead Designer), *Fallout 2*, the whole *Icewind Dale* series, and *Baldur’s Gate: Dark
Alliance, and several cancelled titles, including Baldur’s Gate 3 and Fallout 3. At Obsidian, Chris was the Lead Designer on Star Wars Knights of the Old Republic II: The Sith Lords, moved on to a Senior Design role on Neverwinter Nights 2 and Mask of the Betrayer, worked briefly as the Creative Lead of the Aliens Role-Playing Game (RPG), then went on to lead design on Alpha Protocol, Obsidian’s espionage RPG. He worked on Fallout: New Vegas as a Senior Designer, and went on to be Project Director of most of the Fallout New Vegas Downloadable Content (DLC), Dead Money, Old World Blues, and Lonesome Road. His more recent works include inXile’s Wasteland 2, the Legend of Grimrock movie treatment, the FTL: Advanced Edition, and Obsidian’s Kickstarter: Pillars of Eternity, and is currently working on inXile’s Torment: Tides of Numenera.

To be taken seriously by these industry experts and assist them to feel comfortable in sharing their expertise, I shared a little of my own story as a writer of narrative fiction and digital educational games, a process that I have covered in more detail under the section “Positioning myself in the research”. This is in keeping with the advice of Flick (2009), who suggests that interviewers must “make clear in the interview that they are also familiar with its topic” (p. 168). Once interviews with these key informants had been transcribed, they were reviewed in NVivo 10, using thematic analysis (Braun & Clarke, 2006) to develop a coding schema. Braun and Clarke (2006) argue that a thematic analysis is valuable because it “offers an accessible and theoretically-flexible approach to analysing qualitative data” (p. 77). Expert data was coded according to themes that arose from the interviews, including “Experience in the games industry”; “Understanding game culture”; “Games and their components”, “Narrative and games”; “Potential learning through games”; “The future of gaming”; and “What is required of a professional game writer”. These interviews served to reinforce the need for the detailed analysis of existing games, the process for which is described in Section 3.2.3. These discussions also offered a more nuanced way to approach the interviews with the writers of digital educational games, a process which is described in detail in Section 3.2.5.

Prior to analysing the five case studies included within this study, I spent several months speaking with experts in the field, whose extensive experience was outlined in detail in chapter 3. Selected quotes from these interviews have been used at the top of each chapter within this thesis. These quotes were chosen because they typify the perspective of each expert, and because they reflect the complexities of writing for games in general and educational games in particular.
3.2.2 Study 1: A critical review of the effectiveness of narrative-driven digital educational games

Answering the question at the heart of this study necessitated asking another fundamental question: ‘What does the existing academic literature suggest about the effectiveness of narrative-driven digital educational games as educational tools?’ To my surprise, when I began my research, no critical or systematic review had been undertaken to answer this question. Accordingly, while I gathered the rest of my data, I conducted a critical review of academic literature on the subject, which took approximately six months to complete. The search strategy, inclusion and exclusion criteria, data extraction and data analysis techniques employed in this review have been covered in detail in chapter 4, but the results were crucial in lending weight to my findings within Study 2 (outlined below) and in ensuring that I was not falling into the trap of assuming these games contained educational value simply because I wanted it to be true. This study has revealed that most articles confirm that narrative-driven digital educational games can be effective in achieving their educational aims.

3.2.3 Study 2: Analysis of five best-practice educational games using a standard framework

After ascertaining that narrative-driven digital educational games had been shown to be effective in most cases, I deemed it necessary to verify the claims of my key informants, and of the authors whose work informed Study 1, against existing exemplary games. Before this inquiry could be undertaken, however, it was clear that an appropriately sophisticated game analysis framework must be found. Young et al. (2012) assert that it is important to improve the definition of game features and mechanics, as well as narrative structure within games, as a first step to understanding how these features interact with player goals and intentions, to define the way these games are actually played. For the present study, I compared 4 alternative classification frameworks, representing distinctive approaches to game analysis and design, before choosing one. These were the game-ontological approach (Dahlskog, Kamstrup, & Aarseth, 2009; Elverdam & Aarseth, 2007); the G/P/S model (Djaouti, Alvarez, & Jessel, 2011); the RETAIN model (Gunter et al., 2008); and the Games as Action, Games as Text framework (Beavis & Apperley, 2012).

The game-ontological approach, proposed by Aarseth and Elverdam in 2007 and refined in 2009, was an attempt to assist game scholars and designers to distinguish between...
games based upon “functional categories and conditions that are important to the game” (Dahlskog et al., 2009; Elverdam & Aarseth, 2007). While it offered some compelling ways to think about games, it greatly favoured the detailed examination of the mechanics of games, with the narrative aspects not mentioned. Using this approach for analysing narrative-driven educational games, then, would make it difficult to address some of the study’s central questions.

The Gameplay/Purpose/Scope (G/P/S) model is based upon three elements: Gameplay refers to “… the game structure of the Serious Game: how it is played.” Purpose is based upon earlier descriptions of purpose adopted by the Serious Games market, and refers to the designed purpose, which “… accounts for the eventual purpose(s) apart from entertainment intended by the designer of the Serious Game.” Scope means “… the actual use(s) related to the Serious Game: the kind of market, the audience.” (Djaouti et al., 2011, p. 8). These criteria can be applied to a wide range of serious and educational games, as demonstrated by the establishment, by the designers of the model, of a searchable repository of Serious Games using their (since adapted) criteria. In trying to distinguish between the classification of Serious and Entertainment games, however, the model’s authors have greatly oversimplified the latter, which they defined as containing “only a ‘game’ dimension” (Djaouti et al., 2011, p. 3). This definition undermines the strength of the classification system by disallowing games that teachers might find useful but which would also be found at regular games retailers. Of course, any classification system must begin by outlining its inclusion and exclusion criteria, but these exclusion criteria are so rigid as to disqualify many high-quality games within this study, some of which have won awards for their ability to educate but would also be considered very entertaining.

The Relevance Embedding Translation Adaptation Immersion & Naturalization (RETAI)N model is a game design and evaluation model based upon the belief that a game’s educational value can be determined by evaluating how well the game’s designers have blended academic content with the game’s fictive (or “fantasy”) elements; and how tightly the designers have integrated the gameplay with other instructional strategies. At first glance, this model appears to provide the perfect basis for both the thematic coding of interview data with educational game writers and for the analysis of the games which this group has written. However, upon closer inspection, its creators’ specificity in what they would expect from a high-quality digital educational game may, in fact, eliminate many high-quality games unnecessarily. This is largely due to the authors’ preference for endogenous fantasy elements at the expense of other elements which may engage some players to a greater degree. For this
model to be applicable to a broad range of games, it seems that its definition of quality must at least be expanded to acknowledge that “flow” need only be a concern within the game’s real-time moments, and in games that rely upon the use of real-time to create a sense of “immersion”.

After evaluating these frameworks’ suitability for the classification and analysis of examples from across the educational games spectrum, and identifying their limitations, I elected to adapt the curriculum design framework *Games as Action, Games as Text* (Beavis & Apperley, 2012) for this purpose. In his influential book on the history of gaming, Galloway (2006) defined a game as “… an activity defined by rules in which players try to reach some sort of goal” (p. 19). He also argued that “video games are actions” (Galloway, 2006, p. 1), a sentiment echoed by others, who have suggested that games should be viewed as both “action” and “text” (Beavis et al., 2009, p. 169).

In keeping with this assertion, Beavis and Apperley (2012) created a detailed framework, based upon broad but relevant literature from the domains of literary theory, film theory, game studies, and new/multimodal and traditional literacies, as well as the researchers’ experience in working with and studying the response of students and teachers to games within the classroom (Beavis, 2014). This framework can be seen in Figure 2.
<table>
<thead>
<tr>
<th>Games-as-action</th>
<th>Games as text</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Curriculum design and teaching to foreground</strong></td>
<td><strong>Knowledge about games</strong></td>
</tr>
<tr>
<td>Situation(s)</td>
<td>• Narrative structures and features</td>
</tr>
<tr>
<td>• Players</td>
<td>• Generic knowledge</td>
</tr>
<tr>
<td>• Non players</td>
<td>• Intertextuality</td>
</tr>
<tr>
<td>• Technologies</td>
<td>• Ideology</td>
</tr>
<tr>
<td>• Paratexts</td>
<td>• Literacies/multiliteracies in games</td>
</tr>
<tr>
<td>• Contexts</td>
<td>• How games structure knowledge and participation</td>
</tr>
<tr>
<td>• Status</td>
<td>• Developing critical perspectives on games</td>
</tr>
<tr>
<td>Design</td>
<td><strong>The world around the game</strong></td>
</tr>
<tr>
<td>• Changing the game</td>
<td>• Situated contexts for gameplay</td>
</tr>
<tr>
<td>• Building avatars</td>
<td>• Paratexts</td>
</tr>
<tr>
<td>• Choosing actions</td>
<td>• Literacy practices surrounding games</td>
</tr>
<tr>
<td>• Building objects</td>
<td>• Global contexts for play</td>
</tr>
<tr>
<td>• Community management</td>
<td>• Gaming capital</td>
</tr>
<tr>
<td>• Reflection</td>
<td>• Games and the military/entertainment complex</td>
</tr>
<tr>
<td>Actions</td>
<td><strong>Me as games player</strong></td>
</tr>
<tr>
<td>• Player against computer</td>
<td>• Involvement as player/reader (including engagement and reflection)</td>
</tr>
<tr>
<td>• Player with computer</td>
<td>• Involvement with other players (in game/out of game)</td>
</tr>
<tr>
<td>• Actions in games world</td>
<td>• Physically present/absent, personally known/unknown (includes representation of self and others)</td>
</tr>
<tr>
<td>• Multimodal literacy</td>
<td>• Identity</td>
</tr>
<tr>
<td>• Spatial immersion</td>
<td><strong>Learning through games</strong></td>
</tr>
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<td></td>
<td>• Learning in curriculum areas</td>
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<td></td>
<td>• Serious games</td>
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<tr>
<td></td>
<td>• Learning about learning (including metacognition)</td>
</tr>
<tr>
<td></td>
<td>• Critiquing games/critical literacy</td>
</tr>
</tbody>
</table>

Figure 2. *Games as Action, Games as Text* (Beavis & Apperley, 2012, p. 12)
The framework’s *Games as Action* layer posits that games can be understood by examining three separate yet interrelated sectors: Situations, Actions, and Design. A game’s Situations include who is playing the game, which other characters are involved, where the game is played, and what technologies are in use, and what other auxiliary texts (known as ‘paratexts’) exist to support the game. A game’s Actions define the characters, because it is through their actions that they will be known and understood by the player; and the virtual space, which is defined by how the player interacts with it. This model makes a distinction between the actions performed by the player, and the actions performed by the game, with the understanding that it is the interaction (or ‘feedback relations’) between them that create the gameplay experience. For the creators of the framework, the concept of Design bridges the Action and Text layers. Students, they believe, should not only be able to understand how the elements on-screen combine to create meaning, but they should also be able to replicate this process themselves as game creators.

Within this model, the *Games as Text* layer consists of four sectors: Knowledge About Games, The World Around the Game, Me as Games Player, and Learning Through Games. The first of these sectors, Knowledge About Games, views games as “cultural artefacts”, and focuses on their narrative and aesthetic elements and how these are used across games and within game genres. The World Around the Game sector acknowledges that a game is not played in a vacuum, or in a hermetically sealed gameplay chamber. A game is played in the real world, where players are subject to extraneous sound and visuals, including communication with other people, both wanted and unwanted. This is particularly important in educational games, which must contend with the vagaries of the classroom when vying for a student/player’s attention. Me as Games Player posits that players are positioned by the game, and must accept or resist this positioning, which raises issues relating to players’ values, ideology, and identity, and their role as player/reader/writer. It is closely related to seeing games as cultural artefacts, and to understanding the world around the player. The final sector within this layer, Learning Through Games, refers to the various types of learning that may occur about and through playing digital games.

*Games as Action, Games as Text* (Beavis & Apperley, 2012) had already been shown to be a useful model for practitioners and researchers to understand the way that primary and secondary school students interact with, learn from, and contribute to, game play in a range of settings (Beavis et al., 2009), including games designed to educate the player. I believed that with minimal adaptation it could be re-mapped to analyse and categorise narrative-driven, digital educational games, and to elucidate not only their intended learning outcome but a
multitude of other factors which Young, Slota and Lai (2012) have referred to as “… the complex, dynamic interplay of player intentions, player skills, game affordances, and metagame affordances, as well as the social contexts in which gaming occurs” (pp. 296-297).

The number of games included in Study 2 was restricted to five, allowing each game and the related interviews to be analysed in sufficient detail. Choosing games for analysis within this study was based upon a process of purposive sampling, to allow for the analysis of a broad range of educational games while ensuring that the games chosen were of a high quality mechanically, narratively, and pedagogically. In keeping with the work of Salen and Zimmerman (2004), each game chosen for this study represents a system with which the player interacts, in an instance of artificial conflict limited by rules, to achieve a quantifiable outcome or goals. Based upon the work of Seymour Chatman (1980), each game contains all elements of story and discourse, which – when combined – constitute narrative. Because they combine ludic and narrative principles, these games can be viewed as both “action” and “text” (Beavis et al., 2012), however their educational credentials go beyond meeting this definition. Each game included in this study aims to teach more than simply how to use the game, conveying either subject knowledge or skills or both for the purpose of promoting understanding and/or attitude or behaviour change.

Once I had located an appropriate game, and played a significant portion to judge its suitability, I contacted the CEO/Director of the company responsible for creating the game. If the CEO/Director of the game design company responsible for the game was interested in having the game featured within this study, and if its writer/s were interested in participating, I sent one plain language statement and consent form to the CEO/Director and another to the writer/s. All relevant consent forms needed to be signed and emailed back to me before the interviews or a full game analysis could proceed. The number of writers responsible for the stories of each game differed, so the total number of participants in this group was 8. To be eligible to participate, interviewees needed to have had major responsibility for the narrative of the game in question, such as contributing meaningfully to storyline and character development. They also needed to be willing to talk openly about their writing process, including the challenges they faced and the strategies they used to address these challenges.

It should be noted that, while each of the games included in this study performs an educative function, with some having received prestigious educational awards, two of the games selected for inclusion were created primarily for mainstream consumption, rather than for educational purposes. Choosing these games was an important aspect of the selection process. Educational games do not exist in a bubble, but must often stand alone in a
marketplace, and a classroom, dominated by discussions of non-educational titles (Apperley & Beavis, 2011; Beavis et al., 2009). As such, examining the construction of such games can be highly informative. As Boyle et al. (2016) have pointed out, “analysis of engagement and informal learning in entertainment games can also provide valuable insights into game mechanisms that can then be applied to games for learning” (p. 188). By outlining the approach that the five games profiled in this study take to educating and entertaining the player, meaningful conclusions may be drawn about some of the similarities and differences between narrative-driven, digital games created for varying purposes but which nevertheless perform an educative function.

### 3.2.4 Defining Games as Action, Games as Text for use in game analysis

While the authors of *Games as Action, Games as Text* (Beavis & Apperley, 2012) had clearly defined its major categories, or sectors, its sub-categories had never been fully defined. Therefore, it was up to me to compile these definitions using a range of means. In some cases, the framework’s authors had proffered an explicit definition, which could be used as it stood or simplified slightly without altering its meaning; in other cases, a definition could be constructed from the implicit meaning within the authors’ writing; and, when neither of these methods allowed me to derive a clear meaning for a term, this process allowed me to refine working definitions (Appendix C). To make the model suitable as a tool for the analysis of digital games (including, but not limited, to those designed for education), I developed 120 guide questions which could be used to better understand the construction of such games and their peripheral or auxiliary products (Appendix D). These definitions and guide questions became a schema against which both the games, and themes derived from interviews with the writers of these games, could be matched. My working definitions for these potentially confusing categories, as well as my rationale for choosing each definition, are provided below.

**Games as Action**

- **Actions:** ‘Actions in games world’ could potentially act as a catch-all for any actions the player undertakes within the world of the game. However, to distinguish these actions from those undertaken in service of the game’s creative context, here the actions considered include the rudimentary actions that constitute the mechanics of gameplay. To successfully distinguish between ‘Multimodal literacy’ as it pertains to the heading ‘Actions’ and others involving different
forms of ‘literacy’, this category has been interpreted to refer to the ways in which the player must *demonstrate* their understanding.

- **Design**: ‘Changing the game’ can take many forms. In some cases, however, the ways in which this might be done will overlap with ‘paratexts’. From a design standpoint, however, mods and level designs would fit into this category.
  ‘Choosing actions’ is very broad; rather than going into the specific reasons for allowing certain actions to be chosen by the player (and others not to be), this category acts as a brief introduction to the *degree of choice* afforded to the player by the designers. As such, it might refer to any element of the game’s design/redesign before or during gameplay.

- **Situations**: When considering ‘paratexts’ under the umbrella of ‘Situations’, the most useful frame is that of ‘using paratextual resources’, which constitutes “productive paratextual design” (T. Apperley & Beavis, 2011, p. 140) such as the design of whole games or levels by the player. The creation of paratexts during digital gameplay introduces crucial moments of reflection. This is because players must remove themselves from the immediate responses that maintain the feedback between player and machine to create elements, or to research solutions to problems.

**Games as Text**

- **Knowledge about games**: While this framework refers to the use of ‘Narrative structures and features’, these are not defined by the authors, and can be very broad in their interpretation. Therefore, I have adopted Chatman’s (1980) Narrative Elements, namely Events, Character, and Setting, which constitute the *Story*, and Structure, Point of View, and Time, which constitute the *Discourse*. To successfully distinguish between ‘Literacies/multiliteracies in games’ and ‘multimodal literacies’ previously described under ‘Actions’, I have interpreted this category as referring to what the game player is expected to *understand* during gameplay.

- **World around the game**: There is a clear crossover between ‘Literacy practices surrounding games’ and those relating to both literacy and paratexts. Therefore, I have reserved this category for general comments about the literacy practices that players either currently exhibit or are intended to exhibit after playing the game. For Consalvo (2007), paratexts refer to artefacts which spring up like mushrooms
around a game, and can include elements designed by the student for use within the game as well as more literary-style criticism of the game itself (such as an essay or presentation), which demonstrate critical understanding of the game’s design as a product. It is the latter that will be considered here.

- **Me as games player:** ‘Involvement with other players’ can take many forms, from competing to cooperating in real-time to seeking assistance in the form of walkthroughs or other advice and sharing paratexts. While it might appear that there is a crossover with the previous category ‘Community Management’, the key component under this category should be the player experience rather than an experience that must be ‘managed’ by the design team.

- **Learning through games:** This topic includes the potential challenges or advantages of designing such games, although it is important to rule out ‘ideology’ as a potential location for these points, since that will be covered elsewhere. While players might be ‘Learning about learning (including metacognition)’ elsewhere, this category is reserved for the learning that accompanies playing educational games (either curriculum-based or serious) that actively foster metacognition.

Based upon my previous interviews with key informants, I realised that not all answers could be accommodated under the existing headings. Accordingly, I created two additional sub-categories. The first would allow me to take into account the writers’ backgrounds. I have already described my own experience with narrative as a student, a writer, an educator, and game designer, and the way that these experiences have coloured my perception of the role of narrative for teaching and learning. This new sub-category would allow me to capture detail about these writers’ backgrounds, which I felt might be significant in understanding how they have come to view narrative and its role in these games. The other sub-category I created related to the writer’s personal philosophy about narrative, including what types of narratives he/she valued, and what impact he/she hoped to have on the player through the narrative.

As this is the first time that the framework had been used for this purpose, it might be useful to examine how it was used from a technical perspective. Within Microsoft Excel, a ‘book’ was set up with categories running along the top row and the five games which would act as case studies placed in the first column. While the framework was designed for the
categories to be applied in any order, I applied them in the order in which they were written, and worked from left to right, adding summaries and quotes from the game’s writer, which were extracted from NVivo, where relevant. After completing my analysis of the first case study, I refined the guide questions. With this first case study analysis effectively establishing a proof of concept for the use of the framework as a game analysis tool, I felt confident in proceeding to analyse the remaining four case studies. Rather than analysing them one by one, I worked vertically, analysing the way that a single game element had been addressed in all games. This process allowed me to not only complete the individual case study analysis which forms chapters 5-9, but to compare the use of game elements, which provided the basis for much of the discussion in chapter 10.

Since the Games as Action, Games as Text framework (Beavis & Apperley, 2012) was not developed as a game analysis or design tool, its appropriateness as a way of conceptualising games, including educational games, has been explored in detail in the Discussion chapter, while suggestions for improving the game analysis process, and suggested additions that might be made to the model itself, have been reserved for the Conclusions and Recommendations chapter.

3.2.5 Study 2: Semi-structured interviews with the writers of five highly regarded, digital educational games with a strong narrative component

The interviews with educational game writers which underpin Study 2 involved 9 writers, each of whom was invited to participate in a semi-structured interview (Appendix E). While gender balance was not deliberately sought when recruiting writers for these interviews, 5 of the game writers were female, and 4 were male. Consent to undertake this interview was provided after writers had been sent the relevant Plain Language and Consent form (Appendix F). Before they could be interviewed, I emailed the CEO of the company that had developed the game in question a Plain Language and Consent form (Appendix G) which sought their permission for the game’s writer to discuss the game within the study.

In keeping with issues which arose in discussions with key informants, these interviews were designed to ascertain the writer’s prior experience in the field of creative/professional writing and games design; their experience in writing the narrative elements, for the game in question; their views on the challenges and opportunities that a writer has when writing a game for entertainment and education, and on how narrative-driven educational games could (or perhaps should) change in the near future. Each interview transcript was checked for accuracy as well as breaches of commercial confidentiality by
both writer and the company director. Once interviews with these writers had been transcribed, they were reviewed using NVivo.

Unlike the thematic review of interview data from the key informants, which were intended to be theory generating, the interview transcripts in Study 2 were categorised using themes derived from the *Games as Action, Games as Text* framework (Beavis & Apperley, 2012). Once all interviews had been categorised in this manner, it became evident that some sub-categories (or themes) had received very few mentions, while others had received many. Categorising interviews in this manner was designed to illustrate the extent to which these educational game writers’ views aligned with this theoretical model. Where alignment could not be established, statements were placed into other categories that could be used within the introduction or conclusion to their game’s chapter, including “Professional experience”, and “Other thoughts”.

Each game analysis chapter (chapters 5-9) represents a single case study. A case study is useful for explaining the dynamics present within a single system, and can be made up of one or more “cases”. Researchers conducting a case study may combine data collection methods and may rely on quantitative data, qualitative data, or both. According to Yin (1996), the case study is appropriate when “a how or why question is being asked about a contemporary set of events over which the investigator has little or no control” (p. 9). When studying the development of a product such as a game, this approach offers the researcher the flexibility to use a range of data collection methods. While a case study methodology has been criticised for its lack of generalisability (Campbell & Stanley, 1966; Dogan & Pelassi, 1990), Stake (1978) suggests that the methodology’s specificity is its greatest strength.

When interviews had been transcribed, they were sent back to the participants, who were given the opportunity to check and approve them for accuracy and completeness. If participants felt that their responses needed to be changed for these or any reason, they had the right to do this, an option exercised by 2 of the 5 game-writing teams.

### 3.2.6 Establishing inter-rater reliability

When conducting a thematic analysis of semi-structured interviews with key informants, including experts and game writers, inter-rater reliability was ensured by having coding undertaken by two coders working independently. I acted as one of these coders, as did a graduate student who was familiar with the aims of the study as well as the *Games as Action, Games as Text* framework (Beavis & Apperley, 2012). For expert interviews, where agreement was less than 95% and discrepancies could not be resolved, the coding schema
was reworked to eliminate ambiguities, and both coders agreed to the re-allocation of themes according to this revised schema. For interviews with the writers of narrative-driven digital educational games, which were coded according to a pre-existing schema, the schema itself could not be adjusted, so we discussed discrepancies to locate the most appropriate category. An experienced qualitative researcher, Professor Alun Jackson, acted as facilitator throughout this process.

Initially, comments made by the experts were ascribed to the categories “Experience in the games industry”; “Understanding game culture”; “Games and their components”; “Narrative and games”; “Potential learning through games”; “The future of gaming”; and “What is required of a professional game writer”. Following this process, the interviews were re-examined in an iterative process, in which words and phrases relating to emerging trends became themes or sub-themes. When each new theme or sub-theme was identified, all transcripts were re-read to ensure that matches were considered.

3.3 Positioning myself in the research

The credibility of a qualitative research study relies on the skill, competence, and rigour of the person doing the fieldwork (Patton, 1999). While acknowledging that no definitive list of what to include in a description of oneself exists, Patton states, “The principle is to report any personal and professional information that may have affected data collection, analysis, and interpretation – either negatively or positively – in the minds of users of the findings” (Patton, 1999, p. 1198). He illustrates the unpredictable nature of such an autobiographical description by referring to his own studies in the American mid-West, for which he began training by drinking many cups of coffee in preparation for the 10-12 he would have to drink each day in farm kitchens.

With Patton’s personal illustration in mind, I acknowledge that my own autobiography has affected my collection and interpretation of data in many ways. During more than a decade in the education field, by the time I began this inquiry I had watched education theories used, and abused, to corral students into pathways that may or may not be suited to their learning. An example was Howard Gardner’s concept of Multiple Intelligences. While some within the Australian education system had used the theory much as Gardner had intended, others had completely misinterpreted it, and had used it for more nefarious purposes, as he explained in a report aptly entitled The Ethical Responsibilities of Professionals (Gardner, 2001).
This was what I had begun to think of as a quest for ‘Grails and Gadgets’, a journey which – I feared – might eventually lead to a form of fatigue, as students, parents, and teachers discovered that no single product could ‘solve’ education. According to the OECD’s report *Connected Minds: Technology and Today’s Learners* (Pedró, 2012), while young learners are keen to benefit from the added convenience and productivity gains that technology may bring, they do not want to see teachers incorporating educational technology for the sake of it. When the link between the use of technology-based innovations and improved learning outcomes had not been established, these learners felt that such innovations had the potential to cause them uncertainty, disruption and discomfort.

This sense of scepticism is shared by Gunter, Kenny and Vick (2008), whose analysis of stand-alone educational games revealed that many were underpinned by a lack of sound pedagogy. As they point out, “A failure to base educational game design on well-established learning and instructional theories increases the risk of the game failing to meet its intended educational goals, and yielding students who are entertained but who have not acquired any academic skills or knowledge” (Gunter et al., 2008, p. 511). Despite these issues, when I began my research, I strongly suspected that a high quality, narrative-driven digital educational game could have a positive effect upon student learning, and began to research some highly-respected (likely) and less-well-known (or less likely) examples. By playing these games, and eventually speaking with the writers who assisted in their creation, as an educational researcher and game designer, I hoped to identify which elements, if any, linked successful educational games. As a professional writer, I wondered how these might (or might not) link to Narrative theory or, to paraphrase Chatman (1980), the “what” and “how” of storytelling.

When speaking to expert writers as well as the writers of the five games I chose to analyse for this inquiry, I was conscious of seeming interested in their work, respectful of their experience, and knowledgeable about the writing process as it relates to games. I also sought to listen for when a participant wanted me to speak more, or less, to get to the heart of what they were trying to say. Accordingly, it has been interesting to review the interview transcripts from expert and educational game writer interviews. Within these transcripts, my change in tone both within and across interviews is evident. In the first interview I conducted, with Matt Costello, I was friendly but relatively reserved, clearly hesitating before making suggestions; thankfully, as a regular attendee at game writing conferences, and an experienced practitioner, he had no difficulty in ascertaining what I was asking and spoke about each point at length.
By the time I spoke to the last expert, Veronika M. Megler, my tone had changed. I had read the work of relevant theorists, played a slew of narrative-driven digital educational games, spoken to other experts, and – perhaps most importantly – heard the challenges that I had found as the lead writer of two games articulated by people I admired. Accordingly, I had become more confident that I was on the right track in terms of my research. I was now more conversational in my approach, less attached to the questions as they had been written, and I asked a greater number of follow-up questions than in other interviews. As Veronika and I spoke about her experience, my tone shifted fluidly between authoritative, ‘I believe…’, ‘In my experience …’, and deferential, ‘Would you agree …?’, ‘In your experience …?’. In the passage below, which was transcribed from this interview, my experience with narrative as a researcher, educator, and writer of both broadcast and interactive fiction is evident as I attempt to express my admiration for the open world quality that she managed to achieve in _The Hobbit_ (1982):

It strikes me that it may have pre-empted less, you know, _Elder Scrolls_ or whatever fantasy game, and maybe more pre-empted _Minecraft_! Something where you have, exactly as you say, you know, there are characteristics of things there, whether it’s a zombie or another sort of an object, but in fact what is done in the environment, is actually very much up to the player. I imagine if this was released today, you might have a whole community of people sharing their YouTube videos about _The Hobbit_ and what they’re doing in it, because my story can be my trajectory, as Gee says, could be entirely different. Well, _would_ be entirely different every single time I played it, and different from everyone else’s, you’d imagine. That’s insane, really. It’s great! But that’s hard even to conceive, particularly for me, because I come from very much a linear storytelling background, you know novels and things like that. So it blows my mind, really, to try and think about that. (L. Jackson, interview, 27 May, 2015)

It was not until relatively recently that I was willing to accept that I am inextricably linked with the research. After deciding to divorce this inquiry from an examination into the games I co-created, I had worked hard to remove myself from the research as much as possible, mistakenly believing that it would be of greater benefit to the reader if, like an authorial tone in a novel, my involvement was to become almost unnoticeable. Where I did mention myself, I referred to myself in the third person, or by the label ‘the researcher’ or ‘the author’. I even changed the title of my thesis from _The Role of the Writer in Creating Narrative-Driven Digital Educational Games_, which was wordy but accurate in that it foregrounded the writer, to the more streamlined _The Role of Narrative in Digital Educational Games_. I was not just using language to _express_ my subjectivity – my sense of self – but to _define_ it, limiting my room for personal and authentic expression (Richardson & St Pierre, 2008).
In recent months, a growing awareness of my own shifting perspective, and how this has informed the research questions, my interview technique, and the conclusions I have drawn about the data I have found, has caused me to re-locate myself in the research. Through this process, I have moved away from the “mechanistic scientism” (Richardson & St Pierre, 2008, p. 960) that saw me making statements like ‘unlike quantitative research, in which an instrument may include a survey or other tool of analysis, in qualitative research the researcher is the instrument’, and have moved towards more openly ideological research (Lather, 1986). As such, I have worked hard to make my own history, situation, values, assumptions, and limitations, to allow the reader to judge, for themselves, the validity of my findings. This approach is supported by the work of Koch (1998), who suggests that “… if the research product is well sign-posted, the readers will be able to travel easily through the worlds of the participants and makers of the story and decide for themselves whether the story is a legitimate research endeavour” (p. 1189).

Through this process of self-examination, I have come to terms, also, with the political nature of my inquiry. I have worked as a writer for many years, and understand the difference between a good sentence, or paragraph, or novel, and a great one. I know that its success is due to a multitude of factors that are connected to the work itself, to the author of the work, and to the contexts in which the work is written and received. My research has confirmed for me that these are things that good writers know inherently, and expert writers can articulate. I have written this thesis to explore the complexities of writing for this medium, and to honour those who perform the task well. Finally, I reinstated my original title.

3.4 Underlying assumptions

One assumption that underpins this study is that there is such a thing as best practice in the design of digital educational games, including those underpinned by narrative elements. As an emerging medium, video games continue to develop at a remarkable pace, and so any effort to codify what makes a game best practice is only going to be a snapshot of what makes it best at a moment in time. Nevertheless, the purposive selection of expert writers from within the broader games industry, the careful selection of exemplary educational games, and the rigorous analysis of these games and their creators’ perceptions of them, are an attempt to ensure that any claims made about the validity of findings are clearly justified.
While undertaking this study, temporary working theories were tested and re-tested to check their continued applicability to the nature of the inquiry, and were discarded when they were deemed to have outlived their usefulness. In the thesis proposal, for example, as a professional writer, I assumed that all teams should have a professional writer on staff. Having spoken to many writers of educational games who do not necessarily have a background in writing traditional fiction has challenged the validity of this assumption.

3.5 Ethical issues and risks

This study was designed to allow well-established narrative experts from the broader digital games industry to talk about what makes a compelling narrative-based game in general and a digital educational game in particular; and to give writers who have written narrative-driven educational games an opportunity to talk about their experience, including the opportunities and challenges they have faced and the strategies they have used to create compelling games. I always intended for my research to be published in Deakin’s PhD repository, in both hard copy and as a PDF, and for articles based upon this research to be published in peer-reviewed journals. Participants were made aware of this in the plain language statement, and I assured them that I would notify them of the outcome of my research in writing, including sending each participant a digital copy of the final thesis. No participant was reimbursed or incentivised to participate.

One risk I could foresee for a writer who agreed to participate in this research was that they might damage their professional reputation in some way. In order to address this potential risk, I made them aware of it in the plain language statement before our interview. Once the interview had been transcribed, I sent a copy to each participant and asked them to check that they felt I had represented their views accurately. At this stage, I allowed participants to amend what they had said for any reason, including if they believed that the views they had expressed may affect adversely their professional standing/reputation.

For the Key Informants, my preference was to collect identifiable data, due to their recognised expertise within the broader games industry, and because of the challenges of maintaining their anonymity once they begin discussing specific projects they had worked on. Although I gave them the option to select for their data to be de-identified, none of the experts chose to exercise this option. I gave Group 2 the same option, and two of the writers – those from Pixelberry Studios – chose to be de-identified. Accordingly, they are referred to throughout this thesis as ‘Writer 1’ and ‘Writer 2’. They were not required to provide me with a reason for their decision to be de-identified, and I did not ask for one. I made it clear to
them, as I did to all participants, that even if their name was removed from my thesis and subsequent publications, it might still be possible for people to identify them, particularly since I had recruited them via their CEO/Director.

Throughout the data collection and writing processes, I backed up all data on a regular basis to ensure that nothing was lost. All data, including recorded interviews and transcripts, was stored on a password-protected computer and externally on a password-protected Dropbox site which only my supervisors and I could access. Any hard-copy data was kept in a secure filing cabinet at Deakin Burwood. For those participants who had asked for their data to be de-identified, any documentation linking their name with their identifier was kept in a separate file to recorded interviews and transcripts. In accordance with University policy, I also filed a copy of all data collected with Deakin’s University Services for protection and preservation.

The application for this study was considered by the Faculty HEAG under the terms of Deakin University’s Human Research Ethics Committee (DUHREC). As the responsible researcher, I was granted ethics approval by the Faculty of Arts and Education Human Ethics Advisory Group (HEAG) at Deakin University on the 3rd of March 2015 (reference number HAE-15-015). The plain language statement was incorporated into the letters to Key Informants, CEOs/Directors, and Educational Game Writers.
CHAPTER 4: A CRITICAL REVIEW OF THE EFFECTIVENESS OF NARRATIVE-DRIVEN DIGITAL EDUCATIONAL GAMES

If you look for example at the incredible patterns that are made by flocks of birds, or schools of fish, it turns out that there are two or three very simple underlying rules that get applied that create incredibly complex behaviour. The Hobbit was really that: I came up with two or three very simple rules that I applied, and was then pleasantly surprised by the complexity of the behaviour of the system that I got back. (V. M. Megler, interview, 27 May, 2015)

Before analysing narrative-driven digital educational games for myself, it was important to understand what is already known, in the empirical literature, about the effectiveness of such games. However, despite the rising number of studies that have sought to explore the effectiveness of digital educational games, to date no systematic or critical review had been undertaken to synthesise what had been learned about one of these games’ most powerful facets: narrative. Within this critical review, I have sought to address this gap in the literature.

4.1 Material and methods

This critical review focuses entirely upon narrative-driven digital games which may be considered ‘educational’, including Serious Games, COTS games and Simulations, which are aimed at any age, available via any delivery mode, in any genre, and are designed to be played in any context. However, this review differs from its predecessors in two distinct ways.

Firstly, while the value of future studies adopting the sort of rigorous, scientific approach suggested by All, Nuñez Castellar and Van Looy (2016) must be acknowledged, this review includes quantitative, qualitative and mixed method studies so long as they have been peer-reviewed and report their findings clearly. The decision to adopt this approach was in direct response to the search strategy adopted by some previous researchers, who have been highly restrictive in the articles they would accept for inclusion, because of which they have been unable to consider a number of studies where the findings – even if less scientifically rigorous in their design or measurements – may nonetheless be of value for understanding why narrative-driven educational games have, or have not, achieved their educational aims.

Secondly, the decision has been made in the present review not to define effectiveness, but to allow the term to be defined by the original designers of each study, to increase the sensitivity of the search for literature. In practical terms, this means that a study
A critical review methodology was selected to locate and analyse these studies because it is both flexible and rigorous, while allowing for the exercise of critical judgment. As Grant and Booth (2009) have explained:

A critical review provides an opportunity to ‘take stock’ and evaluate what is of value from the previous body of work. It may also attempt to resolve competing schools of thought. As such, it may provide a ‘launch pad’ for a new phase of conceptual development and subsequent ‘testing’. (Grant & Booth, 2009, p. 3)

To strengthen the findings, and allow for other studies to be reviewed over time, primary sources were located and synthesised based upon the principles of the Preferred Reporting Items for Critical Reviews and Meta-Analyses (PRISMA) Statement (Moher et al., 2009). This Statement aims to standardise and encourage best-practice in systematic and meta-reviews by providing reviewers with a clear and precise methodology for conducting reviews, including a checklist (Moher et al., 2009, pp. 876-877). The principles of this procedure were adhered to when literature was collected and reported on, with detailed descriptions provided on the search strategy used; inclusion and exclusion criteria; and data extraction methods, all of which are illustrated by a Prisma Flow Diagram (Moher et al., 2009, p. 877). The discussion is predominantly narrative in structure to allow for the explication and comparison of results.
4.1.1 Search strategy

For the initial screening process, inclusion criteria included quantitative, qualitative, or mixed-method research; studies conducted in the developed world in any educational setting; and studies reporting the use of narrative-driven digital games for education. Based upon these criteria, six education and technology-related databases were searched, using the search terms (narrat* OR stor* OR fantasy) AND (digital OR computer OR video OR internet OR mobile OR app) AND (educat* OR serious OR applied) AND game AND effect* NOT toy NOT “digital storytelling”). Limiters included studies published in the English language, in scholarly (peer-reviewed) journals, from 2000-2016. Ultimately, this process elicited a total of 2,502 articles. Other sources of potentially relevant studies were reviewed for inclusion, including five of the top twenty-five highest-impact Education, Social Science, Computer Science, and Computer-human Interaction-related journals for 2014, as defined by SCImago Journal & Country Rank, a portal that includes the journals and country scientific indicators developed from the information contained in the Scopus® database (Elsevier B.V.). These publications, which had an h-index of between 35 and 93, were hand-searched. The combined total of articles located by this process was 2694. After this initial search phase was complete, all references were exported into an EndNote library, where 144 duplicates were eliminated. This yielded 2550 articles to be retained for screening using Covidence, a web-based software platform designed to streamline the production of systematic reviews.

4.1.2 Inclusion and exclusion criteria

The titles and abstracts of each article uploaded to Covidence were read to assess whether it met the criteria for inclusion. Papers were excluded if they reported on educational games that were not digital, paper-based or board games, or if they reported on game-like experiences that were not games, including simulations or transmedia campaigns that did not incorporate a game. Similarly, studies were excluded if they sought to measure the effectiveness of games in which only limited aspects of narrative were present, such as character and/or setting; or if they attempted to measure the effectiveness not of the game as whole but of a particular mechanic (such as the use of narrative agents) or social dynamic (single-player versus multiplayer) on a particular game. In such studies, effectiveness is often measured not against a control group who has not played the game, but against other players playing the same game under different conditions, meaning that the label of effective is relative, and therefore relevant, only to that study. Where more than one paper reported the
results from a study, the paper with the most salient or complete results was selected for inclusion. After the titles and abstracts of 2550 references were screened, 2282 were deemed irrelevant, while 268 were deemed suitable for further examination. After examining the full text of these references, 130 were found to meet the inclusion criteria, while 138 were excluded with reasons recorded. This process is outlined in the PRISMA Flow Diagram (Figure 3).

![Prisma Flow Diagram](image)

**Figure 3. Prisma Flow Diagram** (Moher, Liberti, Tetzlaff, & Altman, 2009, p. 877)

### 4.1.3 Data extraction

The resulting data were grouped into a single table (Appendix H), which was designed to outline the process by which games’ effectiveness has been tested. This table contains the following categories: Authors; Country of Origin; Game Purpose; Mode of delivery; Context for Play; Players per Game; Game Genre; Subject Area/s; Overall
Outcome; Educational Outcomes, including Attitude Change, Behaviour Change, Engagement, Enjoyment, Knowledge Acquisition, Motivation, Skill Acquisition, and Other; Participant age; Number of participants; Duration of Intervention; Method; and Results.

4.1.4 Data analysis

This critical review was designed to answer the question ‘What does the existing academic literature suggest about the effectiveness of narrative-driven digital educational games as educational tools?’ In order to fully address this question, it was necessary to investigate a number of topics which form the basis of Section 4.4. These are: Understanding the effectiveness of game play elements; The proportion of games that were effective in achieving their educational aims; The type of studies conducted to investigate the effectiveness of these games; Effectiveness by design purpose; Effectiveness by subject area; Effectiveness by target age group; Effectiveness by genre; Effectiveness by mode of delivery; Effectiveness by context for play; Effectiveness by players per game; and Effectiveness by educational outcome/s.

4.2 Results

This critical review was undertaken to answer one of this study’s sub-questions, namely ‘What does the existing academic literature suggest about the effectiveness of narrative-driven digital educational games as educational tools?’ Having investigated 130 articles on the subject, it is possible to analyse a game’s effectiveness by design purpose, subject area, target age group, genre, mode of delivery, context for play, the number of players per game, and the intended educational outcome/s. As such, these form the categories for analysis of effectiveness to follow. Where possible, specific examples of narrative-driven digital educational games mentioned within these studies have been used to illustrate these findings.

4.2.1 The proportion of games that were effective in achieving their educational aims

The results of this critical review show, first and foremost, the high proportion of the 130 studies which have demonstrated positive or mixed results for the effectiveness of using narrative-driven, digital games in an attempt to achieve their educational aims (62.3% and 33.8% respectively); this is compared to only 2.3% of studies in which none of the study’s educational goals were achieved, and 1.5% of studies in which there was no difference
between the results of students playing games and a control group. It should be noted that, in most cases where a study achieved mixed results, the researchers did not find an improvement in one area, such as knowledge acquisition, but noted gains in other areas, particularly engagement, motivation, and enjoyment. The only exception was where there were inconsistent results within a single educational outcome when, for instance, the same study had been undertaken using two games, or two classes of students. The total proportion of studies listed under each category of effectiveness are shown in Figure 4.

![Figure 4. The effectiveness of narrative-driven educational games (L. Jackson, 2016)](image)

### 4.2.2 The type of studies that have been conducted to investigate the effectiveness of these games

The methodological and demographic composition of the studies contained in this review represent a broad spectrum, from rigorous randomised control trials to small-scale interventions with qualitative analyses of student and teacher data. This reflects the concern, noted in previous reviews into the effectiveness of games, that there is a lack of homogeneity in the methods employed in measuring effectiveness (All et al., 2013; Boyle et al., 2012; Connolly et al., 2012; Jabbar & Felicia, 2015). The studies selected for synthesis were
undertaken by researchers from 28 countries working alone or in partnership. While this reflects a wide range of locations and potential experiences, there are five countries that stand out as particularly influential in this area. These are the United States, with American researchers contributing to 51 (or 39.2%) of the studies compiled for this review. They are followed by researchers from Taiwan, who contributed to 16 studies (or 12.3% of the total), and by researchers from Spain, the Netherlands, and Great Britain, who contributed to 9, 8, and 7 studies respectively. The dominance in this area of inquiry by the United States is in keeping with the findings of previous research into the broader area of effectiveness of digital games (Boyle et al., 2016).

One of the ways to gauge academic interest in a topic is to view the publication figures over time. As can be seen in Figure 5, it is possible to see a pattern emerge from the data in relation to the studies selected for synthesis, with very low numbers of selected studies published between 2000-2005 (n=5), a moderate proportion published between 2006-2010 (n=40), and twice this number published from 2011-2015 (n=80).

Figure 5. Synthesised articles 2000-2015 (L. Jackson, 2016)
4.2.3 Effectiveness by design purpose

One of the remarkable aspects about the games utilised for these studies was the high proportion of games whose primary focus is educational (94.6%) compared with Commercial Off-The-Shelf (COTS) games (4.6%). While COTS games made up a small section of the results, 4 of the 6 studies involving COTS games deemed these games to have been effective in achieving all their educational aims, as was the one study to cover both COTS and Educational games. While these numbers are small, they seem to offer at least tentative support for the claims that COTS games can be used effectively in an educational setting.

4.2.4 Effectiveness by subject area

Reviewing effectiveness by subject area is something that researchers have called for in recent years (Wouters et al., 2013). The subject areas most often targeted by these interventions were Science (n=34), Mathematics (n=22), and Work Readiness (n=10), which - according to the selected articles - had achieved an effectiveness level of 70.6%, 68.2% and 60% respectively. A group of subjects associated with the Language Arts (known as English in Australia), including English Language, Literacy, Reading, Vocabulary, and Writing, were addressed by 20% of the studies selected for synthesis (n=26), and were deemed to have been effective in a combined 69.2% of these cases. These findings, and others, are illustrated in Figure 6.
Crystal Island: Uncharted Discovery (Lester, Rowe, & Mott, 2013; Lester, Spires, et al., 2013) is an example of a successful narrative-driven digital educational game which is designed to foster the learning of science content as well as problem-solving capabilities in upper elementary school science students.

The game consists of a narrative-centred learning environment, which is intended to contextualise science content and problem-solving tasks with an interactive story. The researchers pointed out that these types of games have the potential to “foster engagement by tightly integrating pedagogy and narrative elements” (Lester, Rowe, et al., 2013, p. 223). In the case of Crystal Island, the narrative consists of an interactive science mystery. The player arrives on Crystal Island, a recently discovered volcanic island, where a team of scientists, including the player’s father, have fallen ill. It is up to the player to investigate the cause of the outbreak and stop its spread. The player’s investigation requires them to manipulate
virtual objects, talk to Non-Player Characters (NPCs), and use lab equipment as well as other resources found around the island. To solve the mystery, the player must engage in both fixed and emergent goals.

After a series of pilots and field tests, which allowed for the refinement of the narrative and interactive elements of Crystal Island, a study was conducted with 153 middle school students. Results of this study indicated that Crystal Island produced statistically significant gains in the understanding of scientific concepts, while a strong positive correlation was shown between learning outcomes, engagement with game content, and problem-solving. A questionnaire designed to assess a student’s presence, or the degree to which they felt as if they had been transported into the virtual environment, revealed that presence was a consistent predictor of performance on learning and problem-solving measures; presence was impacted most by a student’s prior experience with playing games of this type (Rowe, Shores, Mott, & Lester, 2011).

4.2.5 Effectiveness by target age group

The two largest target audiences for these studies were players of secondary school age (n=48) and primary school age (n=38), followed by tertiary and mixed ages (n=20 and n=18 respectively). Of these four major cohorts, games were found to be least effective with tertiary participants, with only 45% of studies deeming that games had met all their educational objectives. Within the other three cohorts, at least 50% of studies were judged to show that games had been effective for participants, with studies focusing on primary and secondary school-aged participants the most favourable (73.7% and 64.6% effectiveness).

4.2.6 Effectiveness by genre

Previous research into the effectiveness of both educational and COTS games on students 14 years or above revealed a lack of variation in the game genres used within GBL, with most studies focusing on either simulations or puzzles; the authors recommended that games of different genres be tested to assess their level of success in achieving learning outcomes (Connolly et al., 2012). Within the current review, thirty-one genres (including some hybrids) and categories were identified. In many cases, the genre had been noted by the authors of the original study; where this was not the case, I assigned the game with the most likely genre based upon the perceived alignment between the game (as described) and genre hallmarks. It should be noted that, rather than offering a definitive categorisation, game
genres are often fluid (Apperley, 2006), their boundaries blurred or even contested, making genre selection a fraught process.

The game genre most heavily represented within this selection of studies was the Role-Playing Game, or RPG, with a total of 21.5%, made up of straight RPGs plus RPGs with other elements such as mystery and strategy, as well as puzzle-based RPGs and Massively Multiplayer Online RPGs, or MMORPGs. Together, these were deemed to have been effective in a combined total of 71.4% of cases in which they were tested. Of these subcategories, RPGs involving mystery (n=6) and Puzzle-RPGs (n=3) were deemed to have been 100% effective. The second most cited game genre was Puzzles (including puzzle-based hybrids), which accounted for 19.2% of the total number. They were also ranked in the middle of three most often cited genres in terms of effectiveness, with 64% of these games deemed entirely effective. Simulations, which tended to relate mostly to health or work preparedness, were the third most studied game genre within this cohort at 16.9% of the total, of which 54.5% were deemed to have been completely effective. These findings are illustrated in Figure 7.

Figure 7. Effectiveness by genre (L. Jackson, 2016)
One example of an effective RPG Mystery is *Murder on Grimm Isle* (Dickey, 2011). The game was intended to foster persuasive and argumentative writing skills amongst students aged 9-14. The player is cast as the investigator whose task is to identify the murderer of the island, Mr. Wolfe. To do so, the player collects evidence, including artefacts, such as a bottle; documents including Wolfe’s last will and testament; and voicemail messages. It is this evidence that will provide the basis for their theory of the crime. The game was initially tested with 20 college students, all of whom identified themselves as digital game players, to determine the way/s in which the game’s narrative may have impacted “player/learner (1) intrinsic motivation, (2) curiosity, (3) plausibility, and (4) transference of game-based experiences into prewriting activities” (Dickey, 2011, p. 456). Of these elements, Dickey noted that curiosity, fostered in large part by the mystery at the heart of the game, was the most useful in assisting students to work through any frustrations they may have had with the technology or gameplay.

**4.2.7 Effectiveness by mode of delivery**

By far the most frequently used technology for delivering digital games was a computer, with 70.8% (n=92) of all games accessed in this way. Games accessed via computer may be played on a desktop or laptop, PC or Macintosh, and may be pre-loaded onto the system or network, or be accessed over the internet via a browser. Perhaps it is not surprising that, with such a high percentage of the games delivered in this mode, the percentage of games deemed to have been effective, mixed, negative, and to have made no difference on computer (68.5%, 27.2%, 3.3%, and 1.1% respectively) closely correlates with the totals for all games. The second most frequently used mode of delivery was mobile application (or app), which constituted 6.9% of the total (n=9), only 55.6% of which were deemed to have achieved all their educational aims. Interestingly, these studies were published after 2010, which indicates that mobile applications are still an emerging trend in educational games research. Their success rate was lower than the related category of Augmented Reality Games, which contained 8.5% of the total (n=11) studies; games in this category were deemed to have been effective in 63.6% of cases (n=7), with the remaining 4 achieving mixed results.

**4.2.8 Effectiveness by context for play**

Perhaps not surprisingly, given the high proportion of games created specifically for educational purposes, 108 (or 83.1%) of the games reported on within these studies were
primarily tested in a school or institutional setting, such as a classroom, school library, computer laboratory, or a combination of these locations. Of these games, 64.8% achieved all their educational aims, 30.6% showed mixed results, 2.8% achieved none of their educational aims, and 1.9% were no different to the control group against which they were measured. The high proportion of games tested within educational settings is understandable, given the practical considerations associated with monitoring and measuring play that goes on outside the classroom. This may account for the relatively small number of studies in which students played entirely at home (n=5). Games designed to be played in a specific location, such as on a city street or in a meeting, made up 11.5% of the total (n=15), with the percentage deemed entirely effective in just 46.7% of cases, with the majority (53.3%) achieving mixed results.

*Mad City Mystery* (Squire & Jan, 2007) stands as an example of the effective use of location-based gaming. In this place-based Augmented Reality Game (ARG), players are armed with handheld computers with GPS capabilities that allow them to unlock information from a specific physical environment. In 2004, three classes of Primary and Secondary school students (n=28), explored the University of Wisconsin-Madison campus near Lake Mendota, to find the most probable explanation for the mysterious death of a local resident and keen fisherman, Ivan Illyich. Their investigation took between 60 and 90 minutes, depending upon their style of play, the number of NPCs they chose to interview, and the number of artefacts, including government documents and quantitative samples, they collected. Findings from this cross-case comparison suggest that the game was successful in accomplishing its aims of fostering an understanding of scientific thinking and the ability to argue scientifically by using evidence.

The researchers suggest that there were at least five factors that contributed to this positive result. These were “the task, social configurations (roles), embedded resources, context (or place), and encompassing activity system” (Squire & Jan, 2007, p. 26). From a narrative standpoint, the success of both the task itself – a scientific game experience with a strong story and powerful themes – and the resources – NPCs with strong and emotionally complex backstories, who often have conflicting views about what happened to the deceased – suggest that narrative elements an important role to play. The findings of this pilot were later confirmed through testing with a larger number of players, totalling approximately 125 from ages 8-65 (Squire, 2008).
4.2.9 Effectiveness by players per game

The majority of games tested within the selected studies were single player games (n=76), followed by multiplayer games (n=22), then games designed to be played in groups of two or more (n=21), with a small number of games offering both single player and multiplayer modes (n=6), 4 games allowing players to play either in single player mode and as part of a group; 1 game allowing play in multiplayer and group modes; 1 other allowing players to play in single player, multiplayer, and group modes within the same game. The findings of this critical review suggest that multiplayer games can be even more effective than single player campaigns in achieving the desired educational outcomes (77.3% compared with 64.5%). While games aimed at groups must be played on site, so that players can be in close physical proximity, this is not necessarily the case for multiplayer games, many of which can be played via a network or the internet, making it possible for learners to play the game whether they are at an educational institution, at home, or - if they are rolled out to various industries – presumably at separate workstations on the job.

Some caution must be exercised when viewing the results of these data because, in many cases, the intended number of players for the game may have differed from the actual number of players, due to local factors which affected implementation. Crystal Island: Uncharted Discovery, for example, was originally intended to be played individually, and has been categorised within this study as such; however, with 800 students playing the game in a number of schools over many weeks, some deviation from this ideal occurred on site, prompting researchers to note: “… Some teachers allowed students to cluster in groups to play the game and others ‘constantly reminded students to play by themselves and not to talk’” (Lester et al., 2013, p. 15). Similar issues were noted in other studies, where students might play the game independently, but then share information or plan how to solve in-game tasks outside of the game (Liao, Chen, Cheng, Chen, & Chan, 2011; Lim, 2008), making it difficult to ascertain exactly how much of the positive or negative influence of the game was due to in-game compared to environmental factors.

Legends of Alkhimia (Chee & Tan, 2012) is an 8-level, multiplayer action-adventure game created by the Game-Based Learning Initiative, a group of researchers and game developers at the Learning Sciences Lab at the National Institute of Education in Singapore. The game was designed to primarily to get 13- to 14-year-old Singaporean Secondary School students thinking like chemists. Professor Chee, who was Principle Investigator on the project, believes that educational games should be more than a “medium for conveying
content” (Chee, 2010, p. 47). When they are not, he suggests, educational games require students to do little more than use subject knowledge to complete the “fairly trivial”, “discrete” and “non-overlapping” tasks. Instead, he argues that students’ engagement in the game should be performative: each student should be viewed as “being” a person within the game, on a developmental trajectory to “becoming” a chemist (Chee, 2010, p. 47).

In an intervention lasting 8 weeks, a single class of science students (n=40) from a typical government-run Secondary School in Singapore worked through six levels of gameplay using their Local Area Network (LAN). Pre- and post-test survey responses were collected from all students. After the intervention was complete, learning outcomes from students in the intervention were compared with those of a control group (n=38), who were given traditional classroom instruction in equivalent topics. Within the intervention group, researchers noted significant shifts in students’ “perceptions of their identity, their epistemological beliefs, their dispositions toward science inquiry, and of classroom culture” (Chee & Tan, 2012, p. 185). Students in the intervention group also performed significantly better on a test designed to assess their knowledge about the practical and conceptual approach to separating a solution.

4.2.10 Effectiveness by educational outcome/s

It was common for studies within this data set to measure more than one educational outcome. Because of this, it was possible for a study to show little or even negative change in one educational outcome while demonstrating significant gains (either as commonly referred to or statistically-speaking) in another. The 130 studies examined within this critical review set out to measure, quantitatively and/or qualitatively, a total of 287 educational outcomes, namely Attitude Change, Behaviour Change, Engagement, Enjoyment, Knowledge Acquisition, Motivation, Skill Acquisition, and Other. It is by understanding the measure of achievement on these learning outcomes that one can fully appreciate the potential for narrative-driven digital educational games in the classroom. Of the 287 educational outcomes measured within these studies, 224 were deemed to have been effective, 35 mixed, 7 negative, while there were 21 instances in which an educational outcome was deemed to have been equal to, but no more effective than, the results of a control group. These results are illustrated in Figure 8.
Given that the clear majority of games included in these studies were aligned with a set curriculum, it seems logical that the most often tested educational outcome was Knowledge Acquisition, which was tested in 113 (or 86.9%) of studies. Within these studies, the researchers’ goals for Knowledge Acquisition were achieved in 79 (or 69.9%) of cases. The next most studied outcome was Engagement, which was examined in 43 (33.1%) of studies, and was deemed to be effective in 38 (88.4%) of cases. Motivation was the next most measured outcome, featuring in 34 (or 26.2%) of studies, where it was demonstrated to have been effective 88.2% of the time. This was closely followed by Skill Acquisition, which was measured in 33 (or 25.4%) of studies, and was shown to be the most effective of all educational outcomes at 90.9%. Despite the very high ratings for both Engagement and Motivation, Enjoyment (which was measured in 14.6% or 19 studies) was only deemed to have been effective in 68.4% of cases. By contrast, while Attitude Change was only measured in 11.5% of studies (n=15), it had an effectiveness rating of 86.7%.

The least effective educational outcome, according to the 4 studies in which it was measured, was Behaviour Change, which had just a 50% success rate. Gordon and Schirra (2011) used an RPG at a master planning meeting in Boston’s Chinatown neighbourhood in an attempt to promote understanding of local issues and community engagement. They
observed that, “While playing a character clearly made an impression on players … it did not translate to an immediate, rational reframing of the issues within the meeting itself”, and suggested that “role-play, within the magic circle, is quite effective in altering decisions that get made only within the magic circle. Outside, different rules apply” (pp. 184-185).

4.3 Summary

Despite the growing interest in using digital games, including serious games, Study 1 addresses a gap in the literature by providing a synthesis of 130 peer-reviewed articles that have empirically investigated the effectiveness of digital narrative-driven educational games. Most studies included in this review suggest that narrative-driven, digital educational games are at least partially effective in most cases, with 62.3% of studies reporting that the game/s they tested met all their intended educational outcomes, and a further 33.8% suggesting that games achieved at least some of their intended outcomes. These results indicate that the effectiveness of narrative-driven digital educational games is not limited to games targeting a specific subject area, learning outcome, or target age group; to games made in a specific genre, for a particular mode of delivery or context for play; or to games involving a particular number of players. Nor does success seem to rely upon games being designed specifically for education or – on the other hand – specifically for entertainment. In short, these findings demonstrate not only the educational effectiveness of narrative-driven, digital educational games, but their versatility as tools for teaching and learning.

Having investigated 130 articles on the subject and learned about some of the features that assist, and impede, these games’ educational effectiveness, I am ready to compare these findings with what I can observe by analysing five best-practice games. By doing so, I hope to discover some of the commonalities and differences between these games, and to understand the process undertaken by those responsible for their narrative elements, to ultimately make some conclusions and recommendations that might be useful to those who want to create, and write, high quality narrative-driven digital educational games.
CHAPTER 5: CASE STUDY 1, HISTORY OF BIOLOGY

All the educational games I’ve done at Playmatics had a writer who did all the writing for the game text. And the reason was not that the writer was necessarily a better storyteller than I was … it was because I don’t know how to write to a grade-level, I don’t know how to write to explicate educational content, and that’s a specialised skill. (N. Fortugno, interview, 15 April, 2015)

The first of five case studies included within this dissertation is History of Biology (Spongelab, 2010). The game is designed to send students on a journey of discovery through a series of missions in which they use scientific techniques and a staged webquest to solve detailed science-related puzzles. History of Biology (2010) is predominantly aimed at Canadian Science students aged approximately 16. As I played the game and interviewed its creator, I sought part of the answer to two research questions: ‘To what extent do five best practice narrative-driven digital educational games function as action and as text?'; and ‘How are narrative elements used, within these games, to promote their learning objectives?’ To structure this chapter in such a way that it explicitly addresses these questions, my findings are presented beneath the 7 major headings provided by the Games as Action, Games as Text framework (Beavis et al., 2009), namely Actions, Design, Situations, Knowledge about games, World around the game, Me as games player, and Learning through games.

The effectiveness of History of Biology (2010) as a teaching tool has previously been reported on in a study involving 9 teacher candidates (3 male, 6 female), who used it in an Intermediate/Senior Biology methods course within a Faculty of Education at a Canadian university (DeCoito, DiGiuseppe, & Friedberg). They played the game over four months and reflected upon the experience of playing, as well as their own perceptions of their readiness for teaching students about related concepts, including the Nature of Science, before and after playing. This study demonstrated that, through the use of explicit-reflective Nature of Science instruction, and the History of Biology (2010) game, these teacher candidates enhanced their scientific and technological literacy, and developed positive attitudes toward teaching school students about the Nature of Science.

The game’s creator, Dr Jeremy Friedberg, began his professional career by completing a PhD in molecular genetics and biotechnology. Following his graduation, he remained on faculty for a couple of years, where he focused on his teaching. During this period, he identified the importance of narrative in science, in that he was routinely required to apply for funding and had to try to make the reader see both the relevance of a study he was proposing and why they should care about it. Prior to working on History of Biology
(2010), he had not developed a game - educational or mainstream - but had grown up as a gamer, playing board games, sports, and digital games.

Upon entering the games industry, Friedberg started a company called Biotechnologies, which sought to explore how to use game technologies to create interactive learning environments. He later founded Spongelab, the company that produced *History of Biology* (2010), which was written by Friedberg in collaboration with Nicole Husein. As the CEO of Spongelab, Friedberg has established a research program that uses the company’s proprietary platform (Stitch) to study the efficacy of games in education, and the gamification of education. Much of the company’s game design is driven by the conclusions that come out of this research, which are based upon aggregated data from more than one hundred thousand students, and the thousands of teachers, who use Stitch on a regular basis.

My interview with Dr Friedberg provided insight into the issues that were most important to him when he conceived of and designed the game. Throughout his interview, his knowledge of science as a discipline, as well as his experience as a successful game developer, were evident. Many of his answers focused on the world around the game, including the economic realities of constructing such a game. He noted a number of factors that have contributed to the successful adoption of the game within particular settings. Key to this success, according to Friedberg, was the use of proprietary technology to deliver the game, which allows a teacher to monitor their students’ progress in real time and to prepare and deliver auxiliary lessons and assessments within the same environment.

Given that he was trained as a scientist rather than a writer of fiction, including fictional games, it is perhaps not surprising that Friedberg made relatively little mention of the narrative features of texts within our conversation. He did, however, mention features, such as the mystery at the heart of the story, and the characters designed to act as mentors, that were incorporated into the game in an attempt to engage the player and allow them to reflect upon their experience during and after gameplay. Friedberg was also very clear about his overarching ideology, which had inspired him to create the game. Friedberg believes that schools should be producing deeper thinkers, and sees games like *History of Biology* (2010) as capable of fostering this kind of metacognition, particularly as it pertains to the potential ethical dilemmas associated with scientific enquiry.
5.1 Games as Action

5.1.1 Action

The premise of *History of Biology* (2010) is that, when their boss, Dr Walden Shyre, disappears, the player is attempting to follow a trail of breadcrumbs left by the master scientist in order to prove themself worthy of discovering the scientist’s greatest ‘treasure’. Because proof is required of the player’s wit and patience, to use language from within the game, the challenges pit the player against the computer both figuratively and literally. Figuratively, the player has been set a number of challenges (n=14) which they must complete in specific ways in order to receive in-game rewards; literally, the player is using a computer interface within the game upon which they must enter codes pertaining to the various puzzles they solve, in order to unlock the ultimate mystery of the location of Dr Shyre.
Dr Friedberg has suggested that the fundamental purpose of the game is to promote problem-solving on the part of the player. In *History of Biology* (2010), he points out, problem-solving provides the germ of an idea for the game, while actually realising effective problem-solving has required the game’s publishers to provide teachers with a system that can track and report their students’ progress.

Because of the complex nature of the problems posed within the game, and the multitude of ways that they can be solved, it is necessary for the computer to assist the player from time to time, keeping them on track within the individual tasks and within the broader game. This is done through the use of in-game emails sent by Dr Walden Shyre and by one of Dr Shyre’s most trusted colleagues, Dr Greenwood. There is also in-game assistance in the form of a help button that can be pressed at any time, which opens a panel of Frequently Asked Questions pertaining to each mission.

After receiving an in-game email in relation to a research task, the player typically uses the internet to discover a piece of information that they then feed back into the game to proceed with the next task. When tasked with analysing an item in their possession, the player has to use a tool in their inventory to manipulate and examine the item, revealing previously hidden information. Each time they complete a task, the player receives an email of congratulations, usually from Dr Walden Shyre or from his colleague, Dr Greenwood.
Completing a task also unlocks a number of letters pertaining to Dr Shyre’s Master Code, which spell out a message, the decyphering of which will signal the completion of all the game’s challenges and unlock one of three alternate endings.

Within individual tasks, the player is potentially confronted by a range of written text types which he/she must read, interpret, and use to solve the puzzles that constitute each of Dr Shyre’s puzzles, or missions. These text types include encyclopedia pages, databases of information on the taxonomy of animals, and scanned copies of historically important scientific works such as Robert Hooke’s *Micrographia*. Complicating matters for the player is that, in many cases, the texts that they must read are publicly available rather than created by the game makers, so the information they require from the page may not be immediately evident and must be read carefully if it is to be decoded successfully. The only confirmation that they have found the right information is when they return to the game interface and attempt to use it to solve the related puzzle. For Friedberg, it is this commitment to authenticity that makes *History of Biology* (2010) unique amongst science education games. By providing the player with a diverse range of authentic resources, the player is engaged in what he refers to as a “blended reality experience” (J. Friedberg, interview, June 10, 2015). He cites the example of a player having to access one of the largest genetic databases in the world in order to locate a specific micro-organism:

> We created the fake page, and worked with the BOLD database [a collection of databases relating to topics including geography and taxonomy]. They loved the game concept, for everything that it is, and they agreed to contribute this, so they created the fake data entry, and internally have logged it and flagged it for what it is, with identifiers, so everyone will know what this is and what it’s related to - and so we augmented the data record. So normally you see a standard profile for a data entry. We added some additional things, like lab notes from Shyre’s notebook, and there’s a couple of figure pictures that would normally not be in a database record. (J. Friedberg, interview, June 10, 2015)

In some games, spatial immersion is created by physically surrounding the player with the setting in which the game is set. In *History of Biology* (2010), a believable sense of immersion is created not simply by the game’s visuals, which are relatively realistic, but by requiring the player to find clues within the real world of the wider internet. In this way, they are as immersed by the tasks as they would be were they really a research assistant for a scientist such as Dr Shyre.
5.1.2 Design

The design of *History of Biology* (2010) is highly directive, in that players are led through a series of missions, which must be completed in a certain order, each based upon the completion of a puzzle that requires the completion of a number of steps. However, many of the tasks can be approached in a range of ways so long as the player arrives at the correct answer eventually. For example, in one task that involves manipulating an existing inventory item, in this case slicing a cork, there is only a single way that it can be sliced and then viewed under a microscope, however these procedures are still relatively complex, requiring the player to make a number of procedural decisions relating to the order in which to best approach the act of slicing. This ‘open’ approach extends to the broader web-quest in which the player is involved. For Friedberg, it should be the task of the school system to produce graduates who are creative problem-solvers, whatever their chosen discipline. He points out that this requires the player to demonstrate mastery of a number of important skills, “... everything from self-confidence, to the ability to take risks, [the belief] that failure is not a bad thing and that failure is actually a very important learning tool; ultimately, creativity comes from the ability to be efficient in all these things” (J. Friedberg, interview, June 10, 2015).

5.1.3 Situations

*History of Biology* (2010) is set within a laboratory, with all but the cut-scenes taking place at the protagonist’s work station, a desk equipped with an encrypted computer and some other physical equipment that is necessary to solve certain puzzles. The protagonist is contacted at the beginning and end of each mission by one of the game’s NPCs, Dr Walden Shyre or Dr Greenwood, either with instructions or with congratulations upon successful completion of a task. In the real world, the game is designed to be played by a single user on a web-enabled computer. This user, it is presumed, would be most likely a high school Science student, who would have some contact with a teacher and other players from within their local environment, such as a school. Presumably, they could discuss, strategise about, and reflect upon, the game with these other people. The addition of a leaderboard, which allows players to view their progress in relation to that of other players from around the world, and the capacity for a teacher to enrol a number of students from the same class as players in the game, has the potential to enhance the cooperative (or even collaborative) nature of the game within the classroom, as Friedberg explains:
We have schools where … we’ve got one kid on a computer with the User Interface up, we’ve got another kid sitting next to them on another computer who’s on Google search, looking at the answers. They’re collaborating, partitioning up the tasks get through a mission to get up some information and then working together. That’s awesome! That’s exactly what we want to see happening with the game. (J. Friedberg, interview, June 10, 2015)

For the educator considering using History of Biology (2010), there are a number of factors that have been designed to identify the game as credible and worthwhile for classroom use. These begin with the title, ‘History of Biology’, which appears to have been chosen predominantly with the teacher in mind, since another name could easily have been chosen that would have provided more of a mainstream video game feel, less clearly marking it as educational. The game’s website also includes curriculum alignment information, a content overview with an explanation of problem-based learning and the other issues that the game seeks to cover, and teacher guides that contain walkthroughs and suggested lesson prompts. From the landing page for History of Biology (2010), it is only one click to learn more about Spongelab Interactive, the company that designed and published the game, and to find a list of their educational clients, partners, and sponsors, as well as their research into game-based and digital learning, all of which paint a picture of a company with robust and current links to education. Additionally, the presence of other teachers, and the number of registered users (approximately 130,000 at the time of writing) serves as a way of establishing the credibility of the game and its penetration within the secondary school game market. In an attempt to ultimately improve teachers’ ability to assess their students’ capabilities and adapt their teaching accordingly, History of Biology (2010) is tied into Spongelab’s proprietary platform, Stitch. As well as providing the teacher with valuable data about their students’ game progress, for the designers, insights gained from players’ participation in History of Biology (2010) have provided a rich source of data for their research into game-based and digital education. As Friedberg points out:

... The granularity of data that we have is incredible. I can actually tell you what type of interactive content male students prefer to use in the last weeks of term in downtown Sydney. And I can show you how that changes week-by-week throughout the semester. (J. Friedberg, interview, June 10, 2015)
5.2 Games as Text

5.2.1 Knowledge about games

Throughout the game, a series of clues allows the mystery of Dr Shyre’s disappearance to unfold before the player, with relevant details revealed in the sequence that best supports the creation of mystery and suspense. As such, it uses many familiar tropes from these genres, including an uninformed narrator, a missing mentor, and a conspiracy. While these tropes might be familiar to those who play mainstream games, however, they may be less familiar within the realm of educational games, potentially providing a (happy) surprise for a player expecting a more didactic gaming experience in Science class.

With a mystery at its heart, the game relies upon a general appreciation of other mystery stories, whether they are games, films, or novels, in which the protagonist is presented with only a few pieces of a puzzle and has to follow a trail of clues to reach their goal. Within the Mystery genre, and typified by films within the film noir sub-genre, it is common to be misled by red herrings, to deal with shadowy organisations, and to negotiate moral ambiguities along the road to solving the central mystery. For Friedberg, secrecy and duplicity have always been, and perhaps always will be, at the heart of scientific discovery.

Citing Craig Venter’s work on the Human Genome Project, wherein he sequenced his own DNA as a shortcut to sequencing an entire genome, Friedberg points out that “So this is science in our world today: the muddiness, and the ethical questionability of everything that we do. This is reality” (J. Friedberg, interview, June 10, 2015).

When designing History of Biology (2010), the team at Spongelab viewed Narrative as an intrinsic aspect of the game, as well as within their broader suite of digital products, with Friedberg suggesting that “Narrative is not something to be thought of outside of everything else, it’s an intimate part of all our infrastructure” (J. Friedberg, interview, June 10, 2015). For Dr Friedberg, a successful game story is one that has as sense of utility for the player. It may be short, or long, simple or complex, as might the gameplay itself; he believes that this should be dictated by what the game sets out to accomplish, rather than forcing a simple game to incorporate a lengthy and therefore potentially burdensome narrative. When it came to writing History of Biology (2010), he and his team attempted to engage the player by creating “… a rich and compelling story, but a story based on historical fact, and real science, and to end up in the very near future” (J. Friedberg, interview, June 10, 2015). For Friedberg, narrative is key to connecting with the player on a personal level, thereby connecting the player to the game’s central themes.
History of Biology (2010) is constructed in such a way that the relatively straightforward investigation that forms the game’s story, and small cast of characters, might keep the player engaged to the end, which is when the narrative and educational threads come together. This is achieved through the use of a simple structure, a narrow point of view, and a re-ordering of events, all of which are geared towards creating a sense of mystery around the disappearance of Dr Walden Shyre and the clues that he has left behind as to his whereabouts and the reasons for his self-imposed disappearance.

The story of History of Biology (2010) is relatively straightforward: the protagonist, a research assistant, arrives on their first day at a new laboratory to discover that their employer, a world-renowned scientist, is missing. After being given an envelope addressed to them by the missing scientist, the protagonist is tasked with solving a series of clues that will give them missing pieces that explain why their boss chose to disappear rather than receive a prestigious award for his work. As they discover the truth about the history of biological research and how various inventions have been used over time, the protagonist comes to appreciate the potential impact of their employer’s new invention. Armed with this understanding, they must choose whether or not to release their employer’s research, and how this can be done to ensure that his latest discovery can be used for the greater good.

The game’s protagonist is introduced only briefly at the beginning of the game, as another lab technician leads him to his desk and suggests that he has been hand-picked by Dr Shyre because of his skills. From this point on, the protagonist is characterised by the actions of the player, and by his predetermined interactions with Drs. Shyre and Greenberg. The most important character aside from the protagonist is undoubtedly the character of Dr Walden Shyre. Because he is physically absent, however, his personality is shown through the design of puzzles and clues, as well as the wording of emails which were designed to be sent automatically to the player upon his/her completion of tasks. For Dr Friedberg, it is Dr Shyre who represents the emotional heart of the game:

... Basically he believed, as a character, that as with every other discovery in history there is the potential for incredible good, but the potential for incredible bad. And he believes that the only way to mitigate that, is that everybody should have access to the information. So he took it upon himself begrudgingly to finish the research, to figure out the solution, to figure out the recipe, and to publish it publicly. (J. Friedberg, interview, June 10, 2015)

Although they are not seen in the Story-Now (the present of the story), the game’s supporting cast consists of the scientists whose lives and works the player is tasked with learning about in order to complete Shyre’s quest. These scientists are brought to life in a
range of ways, including being described (usually in glowing terms) by Drs. Shyre and/or Greenwood, as well as through primary documentation created by the scientists themselves, including a book written by Robert Hooke and letters written by Charles Darwin.

Based upon the relatively realistic treatment of scientific concepts, as well as the inclusion of primary documentation relating to the scientists profiled within the game, it seems clear that the game is set in our world, rather than a fictitious alternate reality, a supposition that seems to be confirmed by the player’s use of the internet and other sources, all of which either actually exist in the player’s here and now. The in-game action takes place within a relatively small setting, with all real-time action accessed through the protagonist’s office inside Dr Shyre’s laboratory. Cut-scenes that occur at the beginning and end of the game confirm that the game is set in a close approximation of the real world.

An initial cut-scene provides background to the present events, while the player’s story - which begins after this cut-scene - takes place mostly in the present, with events from the past alluded to either within the player’s research or through communication with one or other of their scientific allies. Events from the past, whether they deal with the discovery of a scientific concept or apparatus, or with an event more directly related to Dr Walden Shyre, are depicted not in chronological order but when they are relevant to the player’s present experiences. According to Friedberg, story structure followed logically from an attempt to assist the player to understand how the history of scientific discovery has led to the world we live in today:

The first cluster of missions deals with a fundamental, profound discovery: the idea that the cell is the basic building block of life; and then the next cluster of stories deals with the understanding of hereditary information - that there is a conserved pattern of which information flows from generation to generation - and that information resides in the cell at some point, and that leads to the discovery of DNA as sort of the ‘molecule of heredity’; and then ultimately there’s the utility of DNA, which is where it sort of leads into the future. (J. Friedberg, interview, June 10, 2015)

The game is presented from two points of view. The first is that of the player, a research assistant at Dr Shyre’s lab. Presumably, given this appointment, the protagonist has some scientific knowledge and skills, but has little specific knowledge of Dr Shyre’s current predicament, so that the player is forced to search for clues and solve puzzles to reveal the reasons for Shyre’s disappearance. This point of view is physically represented through the top-down perspective of the protagonist’s desk, which provides the main launchpad for each challenge. The second point of view that the player is invited to share is that of Dr Walden Shyre himself. While he is not a playable character, his point of view is conveyed within the
puzzles set for the character, each of which has been designed not only to convey facts about the history of science, and scientists, but to inculcate the player and test his/her moral reasoning in relation to scientific progress.

After the protagonist sits down at his desk to work, time takes on two distinct modes. When investigating the clues that Dr Shyre has left behind, there appears to be little difference between “the time of the story” and “the time of the discourse” (Genette, 1983, p. 29), with the player allowed to spend hours researching the answer to each clue if necessary. Throughout the game, the player receives instructions for completing tasks, and congratulations after completing a task, via in-game emails. Each time the player receives one of these emails, it is headed with a time-date stamp that reflects the actual time and date, adding to the sense that the game is happening at the present moment. It is only after the final clues have been solved and a decision about the future of Shyre’s research has been made, that the game again reverts to a cut-scene, which compresses time, allowing large swathes of story to be told very quickly.

As a staged webquest, History of Biology (2010) is necessarily intertextual, relying upon the player’s ability to read and de-code online databases, encyclopedias, and webpages purporting to represent (fictitious) organisations.

Figure 11. RNA Gallery’s fictitious website contains clues to a puzzle (Spongelaab, 2010)
The game’s content is clearly influenced by the ideological concerns of its creator, beginning with the first cut scene in which a scientist is willing to snub the Nobel committee rather than accept an award that he does not feel he deserves. Throughout the game, the puzzles which the player must solve have been designed not only to convey facts about the history of science and the scientists who have influenced its course, but to examine the ethical ramifications of their work. Friedberg views a game such as History of Biology (2010) as a potential springboard for necessary discussions about the repeating patterns in science, the significance of discoveries including Synthetic Life, and what responsibility all citizens of the world should take as custodians of this information. Dr Shyre’s motivation is similarly idealistic: to ensure that the research is public, so that nobody can control it.

5.2.2 World around the game

When designing a game such as History of Biology (2010), Friedberg points out that the team at Spongelab must serve three distinct groups: teacher leaders and administrator cheque-writers, who act as gate-keepers, and the end user, the student player. Serving these different masters, as well as compensating for students' different motivations for playing and varying preferences in the games they play, means that Spongelab has not had the luxury to totally tailor a game to a particular community; instead, they have focused upon “figur[ing] out something that works at a more ubiquitous level” (J. Friedberg, interview, June 10, 2015). When considering the use of History of Biology (2010), Friedberg stresses the importance of their perceived utility to the various stakeholders. He points out that it is each game’s utility that will determine whether or not they are actually used in class. It is this which he believes is the deciding factor for success for an educational game. While acknowledging that his team is incredibly talented, Friedberg is under no illusions about the difficulties of creating compelling games for educational purposes, saying:

My team ... have incredible ideas of how to make really compelling and amazing games, but those concepts are continually moulded by budgets that are significantly less than the commercial game industry, but they are also profoundly affected by ensuring that the games have high utility. (J. Friedberg, interview, June 10, 2015)

5.2.3 Me as games player

According to Friedberg, one of the aims for the game design team was to make sure that, by playing History of Biology (2010), players would come to appreciate that “scientists are not monoliths, they’re people! They’re intelligent, emotional, irrational, and the stories of who these people were and the world they lived in is so important to understanding what they
did” (J. Friedberg, interview, June 10, 2015). Even Dr Shyre, who is presented as a mentor (in absentia) throughout the game, may not have entirely pure motives. As Friedberg points out, “… He’s using you as a tool and somewhat putting you at risk. So, ultimately, there’s kind of this mentorship, but he’s kind of manipulating you too” (J. Friedberg, interview, June 10, 2015).

*History of Biology* (2010) positions the player as a novice but trained research assistant who would presumably have some knowledge of and interest in scientific practices but is still enough of an empty vessel that they can may be influenced by those who seek to use scientific research for altruistic or commercial goals. While it might initially appear that the game is suggesting that these goals are mutually exclusive, the player’s final choice is not clear: there is no obvious good guy or bad guy that the player is clearly supposed to align themselves with/against. Instead, it is intended that the player’s exposure to a range of viewpoints within the game will determine his/her final choice regarding what to do with their mentor’s research, with all three choices appearing to have benefits and drawbacks for themselves as a character and broader society.

### 5.2.4 Learning through games

As the name suggests, from an educational standpoint *History of Biology* (2010) focuses on Science, particularly Biology, and covers cell theory; the discovery of microorganisms; the function, structure and use of microscopes; classification and taxonomy; classic and modern genetic tools; the central dogma of genetics and the universal code; heredity and DNA; and genomics. The game also introduces students to fourteen scientists and their discoveries within the aforementioned fields of endeavour. For Spongelab, however, it was important to convey to students that, in real life, knowledge is not siloed in convenient subject labels, such as Science, English, and Mathematics. Instead, it is interwoven. This philosophy permeated the game’s design, so that “… in any given mission you’re dealing with content, you’re dealing with the science, you’re dealing with mathematics, you’re dealing with the relevant social context of the time, and all of that comes together in those moments at the same time” (J. Friedberg, interview, June 10, 2015). Friedberg and the team from Spongelab adopted this approach because they felt that it was closer to how learning occurs in the real world: “Often in education you learn the fact, and then you deal with the issues, while this way you deal with the facts and the issues all at the same time” (J. Friedberg, interview, June 10, 2015). By asking students to question the motives and ethics of scientists, and the validity of the scientific method, *History of Biology* (2010) promotes the value of
using metacognition. Taking on the role of a research assistant with responsibility for publishing or not publishing incendiary scientific research is designed to foster a deep understanding of the potential impacts of research. Friedberg insists that the game is designed to demonstrate that “there’s no right or wrong answer per se, but a degree of grades” (J. Friedberg, interview, June 10, 2015). These moral and ethical dilemmas underpin the drama at the centre of the game and will determine the player’s eventual feeling of success beyond the rudimentary completion of puzzles within each mission.

5.3 Summary

*History of Biology* (2010) requires the player to move beyond the four walls of their classroom and even the boundaries of the game itself as they trawl the internet for specific information to help them solve in-game puzzles. In this way, it is impossible for students to play passively, allowing game content to simply wash over them. The challenges are tough enough to require consulting auxiliary information in some cases and require great attention to detail. This is a rich text in terms of the range of narrative and other textual elements it presents to the player, and in the ways it requires the player to interact with these elements. *History of Biology* (2010) requires the player to actively engage in an inquiry into what constitutes responsible research, when the next big scientific breakthrough could mean great benefit to society and great wealth for those who develop the technology, or could spell disaster for the world’s population, or the world itself, if the technology is misused.

For students, *History of Biology* (2010) represents an authentic learning experience that not only allows the player to improve their knowledge of the history of biology but pushes them to question some of the larger implications of the search for answers through science. While creating such a large game has presented the game’s creators with challenges, particularly due to the breadth of knowledge required to be taught to the player within the fictive scenario, Spongelab have adopted many approaches to maximise the player’s experience. The player’s macro-journey is tightly controlled, while the puzzles themselves offer the player a lot of latitude. Within this context, narrative works to create the dramatic stakes for the game, and to heighten a player’s sense of empathy. It is these narrative elements that underscore the importance of the inquiry the game’s heart. As the player runs web searches, reads online encyclopaediae, databases, and digital texts, they are not behaving like a student, but like a research assistant, making the game a perfect example of epistemic learning.
CHAPTER 6: CASE STUDY 2, HIGH SCHOOL STORY

Now, what I am talking about is life. And you live your life and then you tell stories about your life. So, the living of the life comes first, and then you abstract, or choose, particular themes that you want to reflect or develop and then that becomes the story that you tell about the life that you lived. And what I would love to see more of in games, is the moral ambiguity that you end up with in life. (V. M. Megler, interview, 27 May, 2015)

The second of five case studies to be examined for this study, *High School Story* (2012) is a mainstream, freemium game, meaning that it is free for download as a mobile phone application with limited functionality but that the customer must pay to unlock aspects of the game. It is designed to allow the player to create a high school the way that he or she would want it to be, placing the buildings and naming the characters so that it feels personal and fun. Many quests within the game are the sorts of adventures familiar to those who watch teen movies, involving friendships and rivalries within and between cliques and local schools, in which the drama centres around personal relationships between students. It also contains a small number of quests that are designed to be educational, allowing the player to investigate serious social issues and revise their vocabulary for the Scholastic Aptitude Test (SAT), which is designed to assess American students’ college readiness. For students outside the United States, SAT-preparation may be unnecessary; however, these side-quests are designed to be fun to play, and to provide enough of a narrative incentive, to be enjoyable.

In preparation for my analysis, I interviewed two of the game’s writers, who wished to remain anonymous, and who will accordingly be referred to as Writer 1 and Writer 2. Writer 1 began working at Pixelberry Studios only a year before she was interviewed for this study. An English major, she had interned at a publishing company while studying, but this was her first job after graduating college. As a junior writer on *High School Story* (2012), it was her task to develop a quest every week, which had included developing educational content for the extra credit SAT quest. She had also designed questions for an in-game polling feature which was designed to make the game feel current for the player as they answer questions about issues in the news and popular culture.

Writer 2 had been working at Pixelberry Studios for approximately 3 years when she was interviewed for this study. A Public Health and Education major, she had written in her spare time before taking on the role of writer for Pixelberry Studios. When completing her Master of Teaching, she had recorded many anecdotes relating to students’ high school experience, which she has been able to tap into while working on *High School Story* (2012). While at Pixelberry, she has written educational content to assist players to develop their
SAT vocabulary, as well as writing educational quests relating to both cyberbullying and eating disorders. Writers 1 and 2 pointed out that, in a relatively small studio, while they might be listed as writers rather than artists, all aspects of the game must be worked on by everyone:

Every quest that you write has been touched by at least four or five other people! So, as much ‘ownership’ as I might feel over Kallie, I don’t really have any! [Laughs.] She belongs to all of us, and there’ll definitely be times when I’ll be like, ‘Writer 1, does this sound right? Does this sound like something she’ll say?’ (Writer 2, interview, April 22, 2015)

![Figure 12. A promotional image for High School Story which changes ‘theme’ depending upon the season (Pixelberry Studios, 2015)](image_url)

6.1 Games as Action

6.1.1 Actions

*High School Story* (2012) is designed for the casual game player to enjoy on the move. Spatial immersion is created through the use of simple but catchy music, and high contrast colour graphics with a cartoon feel, combined with repetitive gameplay and short-term gratification as quests are completed and prizes are awarded. On a macro-level, player
actions allow for the personalisation of the character’s appearance and environment, as well as the naming of key characters (NPCs) and the selection of the order in which to undertake quests. In the case of quests with a time limit, the player may choose not to undertake them at all without affecting the ongoing experience of playing the game.

At the micro-level (within the majority of quests), the action in which the player is engaged is typically very simple: clicking through screens to engage in a conversation with other characters, and making small choices which will affect the tone of the conversation (‘confuse Natalie’ vs. ‘make Natalie mad!’) in order to progress the story (which only has one possible outcome). The interest lies in finding out what happens in each of these short quests. The quests designed to assist the player in practicing their vocabulary for the SAT work a little differently, with the player moving along a trail in which each way-point represents a mini-game such as a series of words that must be correctly categorised within a set time, allowing the player to accrue a number of stars (1, 2, or 3) depending upon their speed and accuracy.

At times, NPCs act as competitors for the main character, taunting him/her or actively trying to block their plans for the school’s success. A key antagonist is Max, who appears at first to be a bad guy. As with many of those who initially oppose the player, however, Max reveals himself to be more nuanced (and vulnerable) as the quests go on and we learn more about his family. It is often these sorts of revelations that can turn an enemy into a friend. A larger opposing force is actually the time that it takes to complete quests (that is, the time between the player making a decision, such as to play in the school band, and the time when the band actually begins to practice). This time can be shortened if the player has in-game currency to spend to rush it; otherwise, they have to wait, and move on to other quests in the meantime.

Much of this game is set up to foster a sense of working with, rather than against, the computer. The quests are usually quite small, with larger quests divided up into a number of parts, making it quite simple to play through a number of quests in one sitting. Within these quests, it is difficult to get lost, and with only limited options for dialogue choices it is hard to make the wrong choice, meaning that progressing will lead the player inevitably to the end of a quest. However, with so many quests, NPCs, in-game currency and reward systems, not to mention costumes and other purchasable items, it can be necessary to seek support for the player to ensure that he or she is maximising their opportunity to create the best school they can. This support can be found in the game by visiting a help screen located under settings; it is very extensive and listed by topic. In the mini-games, associated with SAT practice, it is
possible for the player to retry the task as many times as they like in order to improve their score and/or increase their confidence with core content knowledge.

Throughout the game, the player builds up in-game prizes as a consequence of completing them, which can then be used to improve the school’s buildings and grounds (which will in turn allow the player to unlock more quests). As a freemium game, purchasing special coins and other items outside the game will give the player a greater amount of in-game currency, which allows them both to access otherwise-inaccessible content (such as specific quests) as well as to speed up events which would otherwise take minutes, hours, or even days to complete.

6.1.2 Design

*High School Story* (2012) is very design-oriented. The player is able to manipulate many elements of the look and feel, from their own character to the school’s grounds, as they seek to create a school that they would like to attend. It is largely the manipulation of these elements which allows the player to take ownership of the game. For the designers of *High School Story* (2012), the ability for a player to design a school in the way their like, or take charge creatively by, for example, spelling their own name in the coloured pathways, is one of the things that makes the game fun. As Writer 2 explains:

> It’s a high school: it has teachers, it has lockers, it has classrooms. And these are things that you can visually build within the game on your map, on your phone, on the screen, but ultimately we don’t know exactly what that looks like for each player, because they have that control. (Writer 2, interview, April 22, 2015)
The player can build and name their avatar, and change their name and appearance later on if they wish. Upon starting a new game, the player is given numerous options for designing the look of their character, from their gender to their face shape and hair style to skin colour and, of course, clothing. With many outfits only purchasable at certain times of the year, it appears that the game makers would encourage the player to be redressing their avatar regularly. The writers pointed out that giving the player the freedom to design and name the characters inside the game allowed players to have fun, and to feel a greater sense of ownership over the game by seeing representations of their real-life friends on the screen. They also hinted at the transformative power that taking on the role of an avatar can have on a player, even if the changes to the player’s physical representation are minimal:

I’m definitely a redhead in the game, and I’m not a redhead in real life. It’s like a tiny example of being able to live a different life and escape into this world of High School Story and be a different person, even though it’s like literally just the colour of hair on my head. (Writer 2, interview, April 22, 2015)

The game’s educational quests, including its SAT practice, have been designed in consultation with educational experts. In the case of the cyberbullying quests, for example, the team at Pixelberry Studios worked with the Cybersmile Foundation to ensure that the content was appropriate for their target audience. They also make sure to offer links, via the game and through social media, to relevant organisations, which players are encouraged to
contact if they or somebody they know is struggling with the sorts of issues covered within these quests. Players can give feedback to the developers via Pixelberry’s website or via social media, where they are also invited to share their in-game accomplishments and experiences.

For Pixelberry Studios, understanding and responding to their community is an essential part of providing a game that continues to change, and grow, with its users. It means understanding what they want from such a game, and what they are tired of, and responding to this as quickly as possible. Writer 2 identifies listening to the game’s community as a sign of respect to the user, saying, “I think a lot of teens feel like big games, and their parents, don’t listen to them. For our demographic specifically, I think it’s important to be listening” (Writer 2, interview, April 22, 2015). When dealing with real issues, listening means being ready to step in if a problem is identified:

After we released [the body image/eating disorder storyline], some of the feedback was like, ‘Oh it’s really good to address this’, and most of the time it was overwhelmingly positive, but we did have a few instances where people who were currently struggling with body image issues would email us and be like, ‘I feel like this quest is really gonna trigger my disorder, or its gonna act as a catalyst for making me feel these feelings that I’ve been trying to deal with.’ And so we actually had to quickly go into our game and add in a warning quest before the eating disorder quest telling people, ‘If you have issues with this topic, you may want to abstain from playing it.’ (Writer 1, interview, April 22, 2015)

Throughout the game, success on challenges is greeted by a dialogue box which invites the player to share their accomplishment via social media. This may act as a reflective technique for players who look back at their accomplishments at a later date. It is also possible to see the number of stars previously obtained on the SAT-specific tasks and to retry these in order to improve this score.

6.1.3 Situations

*High School Story* (2012) is set in a fictitious school run by the player. It is largely modelled on an American high school, or at least what might be considered the popular culture conception of a fictitious American high school. It contains an admissions office as well as a number of hangouts, each of which can hold a certain number of residents of a particular type, such as artists, jocks, nerds, and preps. Other locations include a disco, where students of various types can party together; once a party is complete, a new student ‘type’ will become available. There is a dating island, where couples can be seen sitting together talking, their dialogue (shown in speech bubbles above their heads) becoming more intimate as they
get closer to becoming a couple. There is also a polling office, where the player can answer questions about their favourite school subjects, popular culture, and politics, to win books, which are a form of in-game currency. Physically, the game is played within an app on the player’s phone, which fills the whole screen and is played in landscape mode. The picture can be zoomed in and out to provide differing levels of detail.

At the time of writing, the game has gained most traction in the United States, Australia, the United Kingdom, and Canada. It is designed for mobile phones with access to the internet. Because it is aimed at a mostly teenage audience, the assumption seems to be that these young people will have regular access to the internet, as well as sufficient time to log into the game fairly regularly (every few hours is sufficient, but more often is optimal) to complete quests that are running, in the background, in real time. For the designers of *High School Story* (2012), technology offers exciting possibilities for reaching players in different ways. Utilising that technology appropriately for gameplay is a challenge they are cognizant of:

> Especially with technology just being so much more present and part of this world, part of the world that kids are growing up in these days, it’ll be more important than ever to have games that are really able to reach kids through their iPad or tablets, or through their media. So I would hope that that’s where things are moving. (Writer 1, interview, April 22, 2015)

### 6.2 Games as Text

#### 6.2.1 Knowledge about games

As a simulation, the game’s links to mainstream simulation games are clear, with the player able to accept or reject various quests and, once accepted, to determine the fate of the school and its inhabitants (within the narrative boundaries supplied by the designers). Sometimes, the quest narratives follow similar trajectories to those of popular teen movies, while at other times the trajectory taken by the player will diverge and allow them to explore a different possibility than the dominant, individualistic storyline which is so prevalent in these texts. In their interview, the writers joked about their familiarity with high school books and movies, acknowledging that it is this familiarity that allows them not only to replicate the sorts of storylines that viewers/readers of these texts have come to expect, but to play upon them as well, which was something they did in a Halloween quest:

> Everyone in the town was getting taken over and became these zombies that were studying all the time? And you have to join forces with Max to get to the bottom of it, and then, at the end, you were being attacked by all the zombie studying friends, and
they’re all like, ‘You have to study!’ and you’re like, ‘No I don’t wanna!’, and then you like wake up from a dream. So that’s more light-hearted. Narratively, we had basically like an alternate-reality-type thing, and more of a science fiction-y thing ... (Writer 2, interview, April 22, 2015)

The characters whom the player encounters are based around character types, but major NPCs come with detailed backstories, goals, and fears, which are often revealed through character-specific quests. As these quests reveal and challenge the characters’ core values, they may result in the character making a large mental/emotional shift. For the game’s writers, creating successful characters, whom the player cares about, is the key to keeping them playing in the long term. For a player to be successful from one year to the next, they need to be three-dimensional, relatable, they must develop over time, and they should surprise the player:

In the eating disorder quest, because the main character who is suffering from the eating disorder’s Mia, and Mia’s brother is Max, and Max is like the big bad guy in our game, for the most part, but I think that quest shows a really sweet, tender moment between him and his sister when she’s in the hospital. And, for many players, the first time you see him be anything other than just like rude and obnoxious, and I think it’s a really nice moment. (Writer 2, interview, April 22, 2015)

Figure 14. New characters of different types can be won or purchased throughout the game (Pixelberry Studios, 2016)

The setting depicted on screen is contained within a single map which the player can build and rebuild to suit the changing needs of the school’s students. Other settings are not
depicted visually, but are referred to by characters within the game. These include neighbouring schools, and competitions such as regional science or battle-of-the-bands competitions. Some quests are also set in special locations, such as Hollywood or Hawaii, but their depiction is limited to a written account, delivered through dialogue and third-person narration, as well as the release of new outfits in the game’s store, which are appropriate to the location (such as black tie or swimwear for male and female characters). In this way, all of the travel the characters engage in, whether local, national, or international, is achieved through the written word and the imagination of the player. The music utilised throughout the game is used less to establish setting than to provide a recognisably game-like feel to the game play. Despite the contained environment of the game, the design team strives for consistency when they move from one quest to the next in order to provide the player with a sense of continuity:

... Like, if they go to a particular restaurant, the restaurant may pop up later. Some of our writers have been collecting the names of books and movies that have been introduced, places people have gone, be they restaurants or libraries or whatever, and making a master bible list of things that have been referenced, so that they can be referenced again, to be consistent in the world. (Writer 2, interview, April 22, 2015)

Within the game, quests form miniature stories in and of themselves and, as such, often follow a traditional three-act story structure, in which the player receives an introduction, a complication, and a resolution. Because the player may undertake numerous quests at once, choosing which of the available quests to perform in which order, a series of linear narratives combine to give an impression that each player is moving through the game in a unique manner. For the game’s writers, structure is important to ensure that players have a satisfying experience while playing:

Most quests are eight parts, so you have the first part, which is the intro to whatever story you’re starting, which, hopefully, has a hook. And then the climax usually happens around part six or seven, kind of depending on what else needs to happen, in terms of the smaller climax. Sometimes we have longer story arcs that will go multiple quests... (Writer 2, interview, April 22, 2015)

The point of view through which the game is depicted is physically isometric, seen from nearly above the school, with the player able to zoom in and out at will. In terms of the character whose point of view the player is asked to share, the protagonist is a new student at the school and acts as its architect, both structurally and socially. Despite their omniscience, they are still a character within the game, meaning that they can participate in quests. When doing so, they are referred to in the second person by the NPCs. By playing through the
quests, the player is invited to endorse the underlying values of the game, which they can only subvert in subtle ways that will not have a bearing on the overall outcome of the quests or the game itself.

The ideology of *High School Story* (2012) is established throughout the various quests presented within the game. Through these texts, there are a number of beliefs that become clear, including the notion that high school can be both difficult and positive; that young people can make a difference in the lives of their friends and community; that nobody (or at least nobody depicted within this game) is all good or all bad; that taking the time to learn a person’s story will allow you to understand him/her; and that everybody has struggles which can be alleviated with the help of a good friend. The game’s writers confirmed that, as a company, Pixelberry had codified their ideology, to ensure that it demonstrated values including “inclusivity, the power of friendship and being more complicated than your type” (Writer 1, interview, April 22, 2015). The writers also demonstrated an inclusive ideology when referring to the positive effects that games can have in levelling the playing field for learners:

SAT prep classes and SAT prep books are everywhere, however they’re also very expensive, and not everyone can afford them. And with college being such a huge milestone that everyone is ‘Expected to get to’, and with the SATs being so prevalent in specifically the American high school experience, finding some way to help the kids who can’t necessarily afford to go to the expensive SAT tutoring, or get the expensive SAT prep books. So, even if we’re helping just a little bit, five words at a time, just trying to even that playing field. But also, you know, it’s good to expand your vocabulary in general [laughs]. (Writer 2, interview, April 22, 2015)
For the designers, capturing the player’s interest, conveying necessary information, and keeping them motivated to play are constant challenges, which they have attempted to address through the combination of narrative rewards, such as extra characters, in-game prizes that allow the player to improve their campus, and scores that they can share with their friends via social media. When they wanted to introduce the educational extra credit (the SAT vocabulary revision) feature, for example, they did so by allowing scores to be shared with friends via social media; and by giving the character associated with it, Kallie, emotional weight. This meant that they provided her with an interesting back-story, as well as giving her a pivotal role in subsequent quests.

### 6.2.2 World around the game

The game is designed to be played on mobile phones, in a player’s own time, while social media connectivity embedded within the game allows the player to share their progress with friends. With fan-based social media pages compiling images and stories from within users’ individual games, there is clearly a community established around the game, while the development team is available to support the player via their website and dedicated discussion boards. For those players who might require support with an issue such as an eating disorder or cyberbullying, the game’s website provides links to health care services. Because *High School Story* (2012) has been designed to feel like an extension of the player’s
real world, many of the issues the game covers, either explicitly or implicitly, are those that can be found in the media. An example was the game’s take on sexism during the Gamergate controversy. This situation arose in 2014, as angry mostly-male gamers used online message boards to attack numerous female game developers, journalists, and critics, and the men who supported them. While many of the perpetrators claimed to be defending gaming against those who had no professional integrity, their attacks threatened their targets’ livelihood and even their personal safety. High School Story (2012) used this controversy as a backdrop to explore the overt, and covert, sexism within gaming:

We wanted to do it also through story in an organic way, so the sexism in gaming plotline follows Sakura, who’s a girl gamer character, and she’s like really excited about this League of Legends-inspired game that she plays with this group of guys. And they end up kicking her out of the match because she tries to get them to do something that they don’t want to do, and they end up losing. And then they say some very unkind things about her and being a girl, on [social] media websites. You and your friends try to back her up by being her new teammates, and participate in like a league championship game. And you don’t actually win, but a lot of the other girl gamers are inspired by some videos that you made about it, and an article that you put into like a gamer news site about it. So it was kind of like opening up that discussion, where girls felt that they could be gamers, within the storyline. (Writer 1, interview, April 22, 2015)

6.2.3 Me as games player

The player’s interest is intended to be engaged, initially, by the fact that they are responsible for constructing a school and its students. The importance of this role is conveyed to them by the first potential students they meet, Autumn, who introduces them to the broader setting, thereby setting up the rivalry between the player’s new school and a local, more elite (and elitist) school where bullying and nepotism are rife.

When playing this mobile application, the player is physically absent from the game, and is represented onscreen by an avatar that they can create to look reasonably similar to themselves or quite different. Other players are physically absent from the game for the most part, since it is a single player experience, however there is the provision for a player to link the game to their Facebook feed, meaning that real friends’ names can be imported into the game, and the player can then recreate their likeness (to the extent that the game allows) rather than relying upon the generic names and models suggested by the game. When friends are linked to the player’s game, accomplishments can be shared both ways, meaning that the player can compare his/her progress on the game’s quests to that of his/her friends. For the
design team, allowing the player to establish a connection with people that he or she actually knows brings in a whole other level of engagement and humour:

So one of the big mechanics for *High School Story* is that it’s not just any artist that you bring in, it’s your Facebook friend Hayley who is also an artist, and now she’s in your game, and when you go on adventures with her - like if you send her on a quest, for instance, there’ll be a screen that pops up that now says, like ‘Oh! Luke and Hayley did this awesome art thing together. What do you think they did?’ And it was just like a really fun way of also engaging with your friends on social media. Like, I’ll sometimes even do this personally with my own friends, just to be like, ‘Isn’t it funny that we did this thing inside this game?’ (Writer 1, interview, April 22, 2015)

In the real world, the players of *High School Story* (2012) are most likely to be late tweens and teens. The majority live in either the United States, Canada, Britain, or Australia. Within the game, they are invited to take on the role of a student, but a student who has the power to make a school the way that he or she wants to. For the writers of *High School Story* (2012), giving the player the ability to role-play, and experiment with other identities, is one of the keys to engagement:

… [That] just reminded me how important choices are also in our game. Players sometimes really enjoy our choices, because you’ll be able to take risks in the game that you might not otherwise. Like, you can be kind of like the snarky mean person if you want to - not that anyone’s really mean in our game – but you can still choose how you want to react to something. (Writer 1, interview, April 22, 2015)

### 6.2.4 Learning through games

There are two types of overtly educational quests within *High School Story* (2012), vocabulary revision quests, and quests relating to broader social issues including cybersafety and eating disorders. SAT preparation takes the form of simple word match activities, with points given for correct answers, where the number of points is based upon the speed and accuracy of the player’s response. One concern the game design team had, when introducing Extra Credit (their SAT vocabulary revision quest) was that an overtly educational feature might alienate some of their users who were playing only for entertainment. Despite their initial concerns, the extra credit feature has precipitated an increase in the game’s popularity, even amongst its original player base. According to Writer 2, the key to making education stick is providing a context that the player understands and cares about, meaning that “… the vocabulary definitions are incorporated where the player has to figure out the definition based on context clues, and then remember the definition later” (Writer 2, interview, April 22, 2015).
High School Story (2012) goes beyond offering players curriculum-related knowledge, covering topics that are of relevance to the teenage audience’s everyday life, including cybersafety and eating disorders. In both cases, these topics appear to arise naturally within the game, with characters other than the protagonist presenting the issue as something that they are struggling with. Quests associated with these issues demonstrate many of the complex issues associated with each, and allow the player to make decisions that will ultimately lead them to enact the most positive response to each. Links are provided within the game’s social media pages to relevant health and wellbeing organisations for students who require further support. For the Pixelberry Studios team, building a believable context is essential to teaching what might be considered life lessons:

Cyber-bullying and eating disorders, they happen within the context of life: they happen at school, they happen to your friends, they can happen to you. You can be a part of it and not even realise it, and so having the context of a larger game, I think, was really important for showing the way that it can be anywhere, and it’s an important issue that needed to be addressed. (Writer 2, interview, April 22, 2015)

High School Story (2012) assists the player to consider what it means to be a learner by placing them in the role of a school’s creator. In this capacity, they have access to many of the crucial moments of an (albeit idealised and fairly America-centric) school life made up of homecoming dances, rivalries with other schools, and - of course - learning activities. In order to maintain the connection between the player and an ever-broadening cast of characters, the game focuses on learning tasks that are mostly team-focused, such as working with other students to create an entry for a science fair. By doing so, it presents learning as fun, achievable, and collaborative. Writer 1 notes, also, that it is not just the overtly educational questions which can be of benefit to learners. She suggests that all quests have the potential to educate the player in a broader sense:

Yeah. We always want, even the most fun premium [quests], where it just looks like you’re going to Hawaii for fun or something, even those will have - even if they’re not strictly educational, they’re definitely emotional, or addressing people’s feelings, and learning in that sense. Ideally all quests will have elements of both. And I guess, over time, we’ve been learning how to balance how to incorporate fun into educational or emotional moments. (Writer 1, interview, April 22, 2015)

While the game does not explicitly focus on analysing the construction of games and other texts, there are two ways in which text construction is touched upon. The first is by allowing the player to construct their own avatar and school setting. The second is by relating the school’s populace to ‘types’ that are derived from high school fiction texts such as teen
movies, TV shows, and comic books. Some quests also require the player to act as part of a text-creation team, such as becoming the writer or director of a movie, while another pits teams from different schools against each other in an e-sports-type of competition, thereby positioning the player as a maker, rather than a consumer, of texts.

6.3 Summary

High School Story (2012) places the player in the role of a new student at a school. The challenges are not designed to be difficult, and tend to require time rather than skill to play, but the tone of the game is quite infectious and ties into the player’s sense of aspiration, as they are able to completely reconfigure high school to fit their own model of what high school could be like. The learning curve on the game is smooth, and the gameplay intuitive. As a text, High School Story (2012) offers the player a number of ways to participate in small quests, where they must interact with many characters. From a position of power and influence over the lives and events of other students, the player is given the opportunity to live, or relive, their high school experience in an idealised form in which they are in control. Other factors that play a large role in the game’s design are the use of humour, and the use of real world issues within the game world; the former is used as a way to introduce sometimes challenging issues in a less threatening way, while the latter is designed to create a sense of immediacy for the player and heighten the relevance of the game to their everyday life. The learning activities are rich, and yet they do not seem to have been shoehorned into the game; instead, from a player’s perspective, they appear to arise naturally within the context of play. As such, High School Story (2012) illustrates the potential value of using games within the classroom that have been designed primarily for entertainment.
CHAPTER 7: CASE STUDY 3, GLOBAL CONFLICTS: AFGHANISTAN

Ideally, a narrative designer [wants to] present the player with a choice where they literally stop and stare at the screen for five minutes, because they’re weighing the options in their mind, and they actually have to role-play what makes the most sense for their character because neither decision is clearly right. (C. Avellone, interview, July 1, 2015)

Global Conflicts: Afghanistan (2014) is the second instalment of the Global Conflicts series, the flagship title of which, Global Conflicts: Palestine (2008) won a BETT Award in 2010. Each episode of this series places the player in the middle of a conflict, where they take on the role of a journalist who must often choose a side as they construct a narrative of events. In Global Conflicts: Afghanistan (2014), the player must cover the issue of a school that is about to be opened, and the dire consequences for those who want to open the school as well as those who want to attend it, due to the repressive Taliban regime. It has been designed to educate Secondary School students about the complexities associated with a global conflict.

Co-created by an influential game studies theorist Simon Egenfeldt-Nielsen, the Global Conflicts series has been written about in scholarly papers since the initial prototype for Global Conflicts: Palestine was tested and the results published in 2006. Because of this, there is extensive evidence about the game’s educational effectiveness. According to Buch and Egenfeldt-Nielsen (2006), the prototype was tested at two Danish high schools with 51 students aged 16-20. Designed to be used in History class, the Israeli-Palestinian conflict was depicted through different personal perspectives in order to enhance student engagement and “understand and relate to examples of human motives, dreams and hopes from real life, which play a leading part in the making of history” (Buch & Egenfeldt-Nielsen, 2006, p. 4). By doing so, the creators hoped to assist the students not only to learn core content, but to develop skills that would help them to become “autonomous, responsible and ethical” in later life (p. 4).

During this trial, students’ response to the prototype was overwhelmingly enthusiastic, with some students suggesting that they had learned more from playing the game than in months of History classes. The researchers noted the differing play styles of boys and girls: while both genders engaged in competitive behaviour, the boys tended to compete on a ‘game level’, while the girls competed on a ‘content level’, with the effect that some boys were racing through the game and not picking up the nuance provided within the game’s detailed narrative. The researchers also observed, however, that the game was too
didactic in its current form, and committed to toning down the factual knowledge in order to allow students to better understand the personal perspectives on the conflict.

In a more recent study designed to explore the potential for games to assist in attitude change as part of peace education training, Kampf (2015) conducted a cross-cultural experimental study with students located in countries both directly and indirectly involved in the conflict at the heart of Global Conflicts: Palestine. The participants were 148 undergraduate students, studying Political Science, from Israel, Palestine, Turkey, and the United States. They were tested for attitude change. The results suggested that students playing the game became more impartial, which the researchers attribute to the inclusion of participants’ narratives from both sides of the conflict. These results could be seen in participants from all four nations, although the strongest effects were seen in the two nations not immediately involved in the conflict, namely Turkey and the United States.

Based upon these results, Kampf (2015) suggested that “… These games are useful in engendering attitude change, especially in the form of taking a more balanced perspective and being able to look at the conflict through both lenses” (p. 35). In a related study, Kampf and Cuhadar (2015) tested two games from the series, one set in Palestine and the other in Guatemala, with a cross-cultural sample of Jewish-Israeli, Palestinian, and Guatemalan students. They concluded that, while all students’ views shifted on distant conflicts due to playing the games, Jewish-Israeli and Palestinian students were more heavily influenced by the game set in Palestine than the Guatemalan students were by the game set in Guatemala. They credited the success of both games to their sense of immersion, and to the way that they made a large political struggle personal. They felt that Global Conflicts: Palestine (2008) was more effective primarily because it was concerned with a current conflict, while the episode set in Guatemala related to a civil war that had taken place many years before, and which players may therefore have little memory of.

Raphael, Bachen, and Hernández-Ramos (2012) demonstrated the effectiveness of Global Conflicts: Sweatshops (2009) in establishing a state of flow for players working individually and both flow and cooperation for players working together. The researchers noted that flow was more influential than cooperation in inspiring empathy and the interest to find out more about game topics, but cautioned against generalising from these findings since the method they used to assess student outcomes was based upon a single play session of only 45 minutes and they had not used any of the supplementary materials suggested by the game’s developers.
In preparation for writing about *Global Conflicts: Afghanistan (2014)*, I spoke to the game’s lead writer, Jeppe Herlev Nielsen, who spoke candidly about the game’s design process. Nielsen studied dramaturgy at university, and wrote and directed a number of plays, before entering the game development field. It was in dramaturgy that he first experimented with how drama could be incorporated into games, in a course that assisted students to work within the physical (stage) environment to create game-like scenarios. When he entered the game industry, he spent time working on board games, team-building games, and courses, all of which were aimed at educating the player. By the time he was interviewed for this study, Nielsen had worked on approximately 40 games for Serious Games Interactive. He took on the roles of Project Manager and Game Designer for both *Global Conflicts: Afghanistan* (2014). In this role, he wrote both the story and the dialogue for the game, giving him a unique view of the game’s development process. Nielsen gave his early study in Drama a lot of credit for the way he approached the design of the game:

I guess it makes it easier to write the dialogue. Not so much the actual content, which of course has to be based on some sort of research, whichever topic it’s about, because it’s educational games, but asking, ‘How would this person speak?’ For instance, this guy might talk a little bit different from this guy. I think a lot of the dramaturgy legacy is in the character and the character-building, because for some of the games, the more narrative-driven games that we make, we also use voice actors. So that, of course, adds a lot of character to the game. (J. Nielsen, interview, May 27, 2015)

7.1 Games as Action

7.1.1 Actions

The game begins with the protagonist, whose occupation we do not know, being contacted by his friend by phone. The protagonist gets on a flight, and, once he arrives in Kabul, is unable to get in contact with his friend again. Heading to the area where his friend had set up the school, he learns about the attack on the building and his friend from a village elder. Finally getting in touch with his friend, the protagonist agrees to investigate who might have perpetrated the attack and why. He conducts a search of the school building and is in the process of speaking to witnesses when he is abducted by the Taliban. After almost dying at the hands of the Taliban, he is rescued by the International Security Assistance Force (ISAF). Then, the protagonist must use the evidence he has gathered from the crime scene and from his interviews with locals and the ISAF, to decide on the best course of action and argue his case to both a village elder and the local chief of police.
Throughout much of *Global Conflicts: Afghanistan* (2014), the protagonist, Michael, conducts this investigation into the assault of his friend by walking around and clicking on various NPCs, each of whom can share certain pieces of information depending upon how much they trust the protagonist. It is up to the player to read/listen to the dialogue carefully and show the right combination of cultural awareness and subtlety to elicit the maximum amount of information from each ‘source’. Due to positive affirmation by the NPCs and points being awarded for positive behaviour, it becomes clear that it will be easiest to discover the ‘truth’ if the player adopts a more diplomatic approach. For Nielsen, it was important to structure the actions within the game world so that they increased the player’s learning but did not allow the player to lose touch with their progress through the storyline:

This is back to this balance between … what is narrative, or action; and what is learning? There is an ‘action peak’, where you are captured and you were interrogated by the Taliban, which is the most tense game situation, and then after that we have a ‘boss fight’ where you combine your arguments and try to convince the two guys that they should do whatever you think they should do with this school, which is, I guess, the ‘learning peak’. (J. Nielsen, interview, May 27, 2015)

There are a number of ways in which the game actively works against the player. In mini-games such as when the player must drive from the village to the nearby hills to make a phone call, they are required to avoid boulders on the road and Improvised Explosive Devices
(IED’s) laid by the Taliban; hitting either will result in the loss of one life (of 3), with excessive damage to the vehicle resulting in the prompt to restart the challenge. In the broader game itself, the player is aware at all times that the decisions they make when selecting which dialogue response to choose will have an impact upon how they are regarded by the NPC they are talking to (and potentially by other NPCs down the track). It is this tension that provides much of the drama.

There are also a number of ways that the computer works with the player. These include on-screen instructions, which pop up in overlay and guide the player as to which button to press in order to - for example - formulate an argument that they can then use when speaking to a village elder later in the game. These hints are fairly minimal, with a ‘help’ screen offering more detailed assistance if required. NPCs are also helpful unless they are clearly antagonistic; their ‘help’ is often offered to the player in a veiled form, whereby the player can learn how best to interact with the local populace by reading between the lines of their dialogue and what they seem to like and dislike about both the player and other Westerners who have visited or even ‘occupied’ the country. This is most evident in the final challenge, in which there are a number of prompts which steer the player back to the same ‘main page’ of choices to ensure that he/she is happy with their final choice regarding their conclusion about whether or not the school should be rebuilt.

When moving around the larger ‘game world’, the player is able to use their mouse to ‘point and click’, with the character of Michael responding and walking in the direction they choose. When a dialogue bubble appears upon a character on roll-over, the player can click that character, and Michael will stop to speak with him. The range of actions open to the player is relatively limited in two out of three challenge types: within the driving challenge, the player can move the car backwards, forwards, left and right, to avoid boulders and Improvised Explosive Devices. In an investigation challenge, they have to use a failing flashlight to locate clues amidst the burned rubble of the school before the batteries fade.

In the third type of challenge, which involves speaking with an NPC, the range of actions available to the player is more extensive. When a character speaks to them, the player must choose the most appropriate response from a range of dialogue options which, given the duration of some conversations (approximately 10 statements on the part of the NPC) means that there could be a large variation in how two players interact with a given NPC. The tone of this interaction affects subsequent gameplay, with the most extreme punishment for rudeness being execution by a member of the Taliban. As has already been explained, a mechanic limited to the final conversation is that of choosing which evidence to place under
which category in order to generate evidence-specific ‘arguments’ that can be used to influence NPCs and, ultimately, the story’s outcome.

Figure 17. The driving level begins (Serious Games Interactive, 2014)

The amount of reading that a player needs to do within *Global Conflicts: Afghanistan* (2014) is quite extensive. All dialogue is presented in written format, although it is also spoken by the characters on-screen. The major action of the game is performed in a series of scenes involving conversations between the protagonist and other people, including tribal elders and the Taliban. Because of this, it is necessary for the player to listen (and read) carefully if they are going to select the most appropriate dialogue choice, particularly because sometimes all that separates two choices is the inclusion of a relevant cultural greeting or reference. Multimodal literacy is also required when it comes time for the player to construct his/her argument in order to try to convince the people of the village to either build or abandon the school.

7.1.2 Design

*Global Conflicts: Afghanistan* (2014) does not lend itself to being redesigned by the player. The one exception is the ordering of ‘proof’, collected by the player during their investigation, which can be sorted under particular headings in order to allow for the
formulation of specific arguments. Throughout the game, the protagonist collects clues to who set the fire at the co-ed school, which are automatically loaded into a notebook that the player can access by clicking the upper-right quadrant of the screen. While it is not possible for the player to add their own ‘notes’ to accompany these clues, they need to reflect upon their significance at the end of the game when they must categorise each clue to suggest whether it makes the school more or less safe, for instance. It is by meaningfully categorising the evidence in this way that the player builds up points and is able to mount a convincing argument regarding the school’s future.

Global Conflicts: Afghanistan (2014) is designed to be congruent with History and Social Studies curricula offered in many countries, although it is not explicitly aligned with any one curriculum. The game is intended to be used by students with the support of their teacher. In this way, if the player finds it too difficult to navigate the subtleties of in-game conversations intuitively, it is possible to seek help from the teacher, who has access to the teacher manual via Serious Games Interactive’s learning portal. This manual also contains a sufficient amount about the history and customs of the province in which they find themselves to achieve a successful result. Much of this historical content is also available within the game by clicking the notebook in the top right-hand corner of the page and selecting the ‘History’ tab. Before, during and after playing the game, the player is encouraged to answer questions from a ‘Student Assignment’ booklet which can be downloaded from the same portal. While it is possible to gain information about the game form this portal, it is currently not possible to share in-game achievements on the portal with the broader gameplaying community.

Serious Games Interactive has provided teachers with seventeen suggested student assignments which range from short answers to more detailed reflections upon what the game made them think and feel. For the development team, it was important to structure the game in such a way that it could be paused after each scene so that students could complete activities in class, under the supervision of their teacher. Nielsen points out the crucial role of reflection in playing the game, saying, “I think if you miss that reflection then you are bound to miss a lot of information, a lot of learning, and you are also bound to make a lot of the same mistakes” (J. Nielsen, interview, May 27, 2015).

7.1.3 Situations

Global Conflicts: Afghanistan (2014) is set in Afghanistan circa 2014, specifically in a village within the volatile Helmand Province. This Province is under threat from the
Taliban, but is currently being protected by the United Nations’ ISAF. While playing the game, it becomes clear that this is a village where people hope for a better life, but where they feel oppressed by invasions and by the presence of occupying forces, whether they be Russian, those of the ISAF, or the Taliban. The people are afraid for their own safety and that of their children, and are suspicious of any Westerner, including the protagonist.

Physically, the game is designed to be played on a computer, and takes up the whole screen, with on-screen health and inventory items located in opposite corners. The choice of the language in which the game can be presented, when the player first enters the game, indicates that it is designed to be played by students around the world. This game is designed for a single player who is playing either on their own or with others in a real space, such as a classroom. Because the game is clearly designed to fit within the school curriculum, with support materials including assignments that all students would complete, it seems likely that students might play the game in pairs or small groups so that they can discuss their decisions as they go, particularly in classrooms where giving each student a computer is not feasible.

NPCs also play a crucial role in Global Conflicts: Afghanistan (2014). The player’s investigation is almost entirely based upon interactions with NPCs, who have the capacity to be illuminating or to thwart his efforts to find out the truth. NPCs also create much of the drama of the game, from his friend Allan’s helplessness in his hospital bed to the Taliban’s intended torture of the main character for his interference in the situation, and the fortuitous intervention of the ISAF, without which it is likely that Michael would have been killed by his captors. Other non-players who nevertheless play a significant role in the player’s experience of the game include the other students and teacher/s within the class in which this game is intended to be played, whose perspectives on the game would most likely help to enrich those of the player.

For an educator considering using Global Conflicts: Afghanistan (2014) in the classroom, there are a number of features to recommend it on the Serious Games Interactive Learning Portal. Firstly, it is on a ‘learning portal’, suggesting that the learning potential of the game has been considered. Secondly, there are statements on the page that come from a range of sources, including the game’s co-creator and education researcher Simon Egenfeldt-Nielsen, which explain, in accessible language, some of the benefits of using game-based learning listed under the heading ‘What makes games work?’ Thirdly, while there is no mention of the prizes that SGI’s games have won on this learning portal, a quick web search reveals that the Global Conflicts series was the recipient of a prestigious educational award. Finally, the publisher allows prospective teachers to trial the game for free, giving them the
opportunity to review a game’s quality for themselves before recommending it to students and their parents.

7.2 Games as Text

7.2.1 Knowledge about games

*Global Conflicts: Afghanistan* (2014) may at first seem to be another ‘shooter’: set in a conflict zone, with a male protagonist out to right a wrong and avenge an attack on a friend. However, the game’s premise belies its complexity and unpredictability. The protagonist meets the locals, but cannot beat the truth out of them like the protagonist of a mainstream war or espionage game. He investigates the crime scene, but has no high-tech tools with which to analyse the clues he finds.

[Image: Searching the rubble of the school for clues (Serious Games Interactive, 2014)]

Within the game, the protagonist meets the quintessential ‘bad guys’ of the conflict, the Taliban, and is even rescued by the ‘good guys’, from the United Nations’ ISAF, but the Taliban are not two-dimensional caricatures, and the ISAF are not the typical heroes. In order to play against ‘type’, the writers consulted texts far removed from the usual video game fare when designing the game:
The characters and some of the dialogue, even, are statements from people that [were made to] Oxfam, [which were included] in various reports. Also, we used [the novel] *The Kite Runner*; some of the conversation in that book was also an inspiration. (J. Nielsen, interview, May 27, 2015)

Based upon the fact that he has a friend who works in Afghanistan in a humanitarian capacity, the protagonist appears to be either a former humanitarian worker or a reporter. He is very resourceful, as demonstrated when searching for clues in a crime scene. He is also brave, which is shown by his willingness to proceed in his investigation despite the attack on his friend. However, he does not seem to be a member of law enforcement, because he never reaches for a gun, even when confronted by the Taliban. The NPCs that the protagonist meets on his journey reflect a country in turmoil, and are both traditional residents, such as village elders and teachers; as well as occupying forces of one stripe or another. While NPCs, with the exception of the Taliban, are generally even-tempered, they are quick to anger if the protagonist does not respect their heritage or suggests that he knows how to handle their situation better than they do.

*Global Conflicts: Afghanistan* (2014) utilises mystery surrounding the perpetrators of the crime, and the dramatic stakes of what might happen to the town’s residents based upon the decision the character finally makes about the school, to bind together the events. The mystery and dramatic stakes are further reinforced by having tasks introduced by NPCs who make it very clear that they have a personal stake in the outcome of the player’s visit. For writer Nielsen, the characters’ authenticity was the key to creating a successful game. When writing these characters, he tried to put his own views about the central conflict aside, and allow the characters to express their own opinions:

I would say, ‘Okay, we have Aboula, and he is in favour of the boy’s school, based on his beliefs and tradition and all that.’ So all his arguments would be based on that character’s own beliefs and I would try not to write in to that what I believe about religion or only-boys schools or whatever. And then the idea was to have these various characters that the player can interact with and talk to, [each of whom would] present their own opinion. And they were allowed to be biased. (J. Nielsen, interview, May 27, 2015)

The game adopts a quest structure to create drama. The player receives a ‘call to adventure’ in the form of a phone call from a friend requiring help, and travels to Afghanistan presumably with little idea of how much help he can be, making him a reluctant hero. Once there, he is confronted by the attack on his friend, and locals who are sometimes hostile to outsiders and barely tolerate his questions. It is only by following a trail of clues that the
The protagonist is able to amass enough information about the crime, as well as the plans of both the Taliban and the ISAF, to make a cogent argument for whether or not the school should be reopened. Nielsen referred to this confrontation as a ‘boss fight’, in reference to the classic technique - still used today - of fighting a ‘boss’ at the end of a game level. In this case, the ‘boss’ would need to be convinced before he would agree with the player’s opinion about what should become of the school.

The physical point of view, or ‘lens’, through which the game is depicted is positioned just over the shoulder of the protagonist, so that his torso fills the frame. At times, the camera pulls out further, to give the player a clearer sense of the setting, while the crime scene is viewed entirely from the first-person perspective. Three-dimensional graphics depict the setting in near-photo-realistic fidelity, while culturally appropriate music helps to ‘set the scene’ from Kabul Airport to a rural village or a Taliban hideout. While the player is not forced to share all of the protagonist’s values, being culturally insensitive, particularly in the presence of the Taliban, might get the protagonist killed. For Nielsen, the choice to offer only scant details about the protagonist’s background was an attempt to heighten the player’s sense of identification with him and his situation:

You play a character, and the question is, how much backstory should you put into a character that the player is playing? Or would [the player] rather have this empty slate so they can just [feel like] it is me playing, I’m not playing as someone who lived there when he was younger and then played football and so on. I don’t want that, because then they have to remember all those kind of things and act based on that information. (J. Nielsen, interview, May 27, 2015)

The construction of the game is linear, with some gaps in time to compress what would be a few days’ travel and investigation into under and hour’s worth of gameplay. While the game is relatively free from embellishments such as a flashbacks or foreshadowing, in one section the player drifts in and out of consciousness after being hit in the head with the butt of a Taliban member’s rifle. This effect is reminiscent of that used in many action films. In this case, it heightens the sense of danger posed by the Taliban fighter.

Global Conflicts: Afghanistan (2014) is overtly ideological, with the game’s premise positioning the player as both investigator and arbitrator of an inherently complex situation. According to this ideology, there is no such thing as a ‘wrong’ side of an issue, because everybody’s point of view is influenced by their own experiences, and that it is only by understanding and respecting these experiences that one can hope to gain any traction, or indeed compromise, between those involved in such a conflict. Nielsen suggested that writing a game that explores sensitive issues can be tough, saying, “We don’t want to tell you what to
believe. I mean, we don’t want to tell you that this is the truth and everyone should believe this” (J. Nielsen, interview, May 27, 2015).

Despite his best intentions, and attempting to recognise both his known and unknown biases, Nielsen was aware that sometimes creating a game that is engaging necessitates ‘taking a side’. The answer, he suggests, is not to attempt to create a completely ‘balanced’ game, but to develop students who can look at a situation in a more critical manner, asking the same sorts of questions that he himself asked when analysing information for inclusion within the game. For Nielsen, ultimately the aim of the game is to immerse the player in Afghan culture and the complexities of the conflict to the point where they will be able to see past their pre-existing expectations and biases and form their own opinion about the situation they are presented with:

You need to be able to filter where you get your information from. Especially if it’s like Afghanistan: place where a lot of the information comes through in a period of war. Then it’s like, ‘Okay, so is this believable? Who says it? Is it reported after the fact, you know, like, two years later by somebody who wasn’t there?’ How do we filter the information we get? (J. Nielsen, interview, May 27, 2015)

Figure 19. Confronted by the Taliban (Serious Games Interactive, 2014)

7.2.2 World around the game

When the game was first released, the United States and other nations had been involved in armed conflict in Afghanistan for approximately a decade. While public opinion
certainly suggested that people were ready to bring these troops home, teenagers - the target demographic for the game - had grown up seeing Afghanistan occupied in this way for much of their lives. It is possible that, for many of these players, this game represents the first time that they have heard, or considered, what it has been like for everyday Afghans to live with the reality of this conflict. Within certain circles, it might be impossible for players to enjoy such a game, if their local culture supports the involvement of troops no matter what the justification for their presence. For Nielsen, being aware of the way that his audience might respond to the game went beyond understanding their usual likes and dislikes, requiring a detailed knowledge of their understanding of the war in Afghanistan and their country’s role in it:

At the time [the game was developed], there was a lot of discussion, at least in Denmark, about [our involvement in Afghanistan]. I think, by the time we made the game, we had been in Afghanistan for 10 years. And we hadn’t really been a war-faring country before. So it was kind of interesting just to see the debates. In the news, it’s always about when another soldier dies, and you keep track of [the number]: now it’s 25 soldiers that have died, now it’s 28, and based upon that you decide whether this is a good thing or a bad thing. So there was a lot of discussion whether it was right or wrong or what are we doing there, and all that. (J. Nielsen, interview, May 27, 2015)

With materials prepared to assist with its use in the classroom, it is probable that most use would occur in an educational context, if not within the classroom itself. While the game is designed as a single-player experience, when played in class the screen can be shared by two or more players, with players discussing the most appropriate way to respond to an NPC prior to making their selection with the mouse. For Nielsen, the optimal way for the game to be played is side-by-side with other players, in a classroom context:

For these games, we make educational material for the teacher manual. We very much encourage the students in the classroom to discuss it afterwards, so they catch some of these places where there might be some bias in the narrative structure based on how I did it. Then people can say, ‘Hey, he was such-and-such [referring to a particular character],’ and some other guy will say, ‘No, that was just [how you perceived him] because you only had those two [conversation] options,’ for instance. (J. Nielsen, interview, May 27, 2015)

For Nielsen, creating a game that is of high quality but still meets budgetary constraints and adheres to a strict deadline is a constant challenge, particularly when outside parties such as universities are involved. While acknowledging that he would like to incorporate all the features that a well-meaning university might want him to, he suggests that shipping a product always requires “balancing reality with your ambition” (J. Nielsen, interview, May 27, 2015).
7.2.3 Me as games player

Before, during, and after playing the game, the player is encouraged to discuss and reflect upon their views regarding the issues raised by the game, including the way that their own behaviour either alleviated or exacerbated these issues. Beyond these play sessions and periods of discussion, they might feel more interested and/or able to understand not only the plight of school children (particularly girls) within Afghanistan, but issues of social justice in Afghanistan and in other areas of conflict. For Nielsen, creating a game that could not only gain and maintain the player’s interest but also challenge them to think differently about the conflict they were presented with, was primarily a narrative challenge:

The goal was to make some characters that the player would remember, and a storyline that was intriguing enough to make them feel like they had a fictional, but at least a sort of, an experience of what Afghanistan, the people, the culture, and that kind of stuff, would be like. (J. Nielsen, interview, May 27, 2015)

Figure 20. Rescued by the ISAF (Serious Games Interactive, 2014)

As a browser-based game, the player is physically absent from Global Conflicts: Afghanistan (2014), with a generic avatar taking on the role of Michael. As a single player game, no other players are visible or required for the game to function. However, in the situated environment of the game (for instance a classroom) it is highly probable that players will work together, which gives them the opportunity to discuss the game and come up with
strategies to complete its challenges together. For the design team, teamwork is seen as the key to fostering learning:

We try to push for basically all our games being played by two kids. Peer teaching or training, and the discussion they have while they make decisions, are extremely important when it comes to learning. So I think that would be the optimal situation. (J. Nielsen, interview, May 27, 2015)

While the game appears to position the player as socially-minded, the fact that it allows a player to deviate substantially from the ‘optimal’ path (even to the point where the protagonist will be killed) means that players can experiment with what happens when they take a less diplomatic approach to the investigation. For Nielsen, it is the player’s identification with the protagonist that provides the key to enhancing their understanding of both the issue and its possible ramifications:

At the end of the game you have to decide, together with the police chief and the old guy from the city, whether this school that at the beginning of the game is burnt down by the Taliban, should be reopened, and whether you want to make it a school for both girls and boys, which of course is an issue for the Taliban ... If you have this experience with threats actually being pointed at you instead of some random Afghan people, then maybe you would think twice about, yeah, we all want the kids to have a good education, but do we want it if it means that somebody comes and kills us? (J. Nielsen, interview, May 27, 2015)

7.2.4 Learning through games

Global Conflicts: Afghanistan (2014) explores life through the eyes of a visitor to Afghanistan, introducing the player to the country’s history and culture within a dramatic context. Within this conflict zone, the player explores topics that are relevant to Social Studies, Geography and History curricula, while the problem-based learning provides students with the opportunity to demonstrate critical and creative thinking as well as ethical decision making. When writing the game, Nielsen worked hard to balance the narrative and mechanical elements as seamlessly as possible with the educational content in an attempt to ensure that students would not become ‘overloaded’ by the entertainment and forget what it was they were supposed to be learning. The game’s context allowed him to explore not only the more obvious educational possibilities, but some more subtle ones as well:

I think the conscious decision was to make something that presented various perspectives on the conflict, so that you as a student might be able to form your own opinion. That was the written-down purpose of the game. But of course there is a lot of secondary learning, hopefully, to pick up from the game, like even how to talk to people. So, if I decide this, and this guy gets angry, [I can think about], ‘Okay, maybe I should consider how I ask [questions] and how biased I am when I criticise someone, and that kind of thing. (J. Nielsen, interview, May 27, 2015)
To successfully complete *Global Conflicts: Afghanistan* (2014) requires a high level of metacognition. Firstly, the player is reminded that they are a visitor to the region, and must learn the local people’s customs if they hope to survive and find out what happened to their friend. Secondly, a major theme of the game is the importance of education, or ‘learning’, with the player given the task of investigating who burned a school down and why, an inquiry which leads them to explore issues relating to the value of education, its potential to frighten those in power, and the necessity of preserving everybody’s right to an education. In this way, the game depicts education as a privilege, one that - by virtue of their having access to the game - the player might come to more fully appreciate by the time they finish playing.

While it was not designed to specifically critique games or other texts, by presenting a narrative which runs counter to much of the simplistic treatment of the Afghanistan conflict in mainstream media, and which involves the player entertaining opposing views about the conflict, it is designed to have the player actively question the validity of such texts. By incorporating the possibility that the protagonist will be killed for acting with a lack of diplomacy, the game also subtly challenges popular ‘war’ games, such as *Call of Duty*, which position the player as an almost indestructible soldier with as many lives as they require to complete the mission.

### 7.3 Summary

*Global Conflicts: Afghanistan* (2014) places the player in the role of Michael, a protagonist of unknown origin, who has travelled to Afghanistan at the request of his friend Allan. Allan, a Westerner, has established a co-educational school in a volatile province, because of which he has received threats against the school, its students, and himself. Investigating who has made these threats requires the player to undertake an investigation that is a long way from the sort of ‘shoot-em-up’ approach to international relations often depicted in mainstream games, with which students would likely be more familiar. With a complex scenario at its heart, the possibility that their game could end with the protagonist’s death at the hands of the Taliban, and – should they get to it – a ‘final act’ that is certain to hurt some Afghans, playing the game requires the player to be attentive and critical in their thinking. Designed to be played in a class within which issues arising from the game can be discussed in detail, this text has the potential to provide the basis for extensive discussion and analysis by students and teachers.
CHAPTER 8: CASE STUDY 4, HACK ‘N’ SLASH

Once I made the shift from instead of applying a verb to a specific hardcoded object to apply that verb - that verb exists as an action, and it can be applied to any object that has that set of characteristics required for that verb to apply - it meant that people went off and did all kinds of stuff that it never occurred to me that anybody would do. (V. M. Megler, interview, 27 May, 2015)

Hack ‘n’ Slash (2014) is a mainstream game that was not designed with any pretensions to be educational. Despite this, the game’s focus on hacking, and its connection to programming, make it a valuable example of how an age- and conceptually-appropriate mainstream game might be co-opted for educational purposes. In Hack ‘n’ Slash (2014), the player is presented with a world much like that of the original Legend of Zelda™ (1986), where an evil wizard has mandated that everyone stay in the village, and martial law has been declared. It is up to the player to find the princess and work out what the wizard’s motives are, both of which can only be discovered by rewriting the world’s code with the help of some seemingly magical objects. To bolster and extend upon my own observations about Hack ‘n’ Slash (2014), I interviewed Brandon Dillon, the game’s creator, and Erin Eldridge, who was brought on as a freelance writer for the project.

Dillon had the sort of early career that one would imagine is perfect for a future game developer. He got his start in the industry when, at only 13, he began working as an intern for the Quality Assurance team at Blizzard Entertainment, the makers of the MMORPG World of Warcraft. Years later, after working as a programmer at ArenaNet in Seattle, making Massively Multiplayer Games, he was promoted to role of lead in a prototyping team, which gave him his first game design experience. It also exposed him to the use of narrative in MMORPG, which he identified as siloed off from the main gameplay so that it could be explored by those who were interested in reading a detailed backstory, but could be avoided by those who just wanted to gain points. When he moved on to Double Fine, Dillon began writing games, having decided that he was “hungry for something where the narrative was more central to the experience” (B. Dillon, interview, August 7, 2015). As an independent game, Hack ‘n’ Slash (2014) was created by a small team of developers, including around 5 people at any one time, so Dillon had to wear many hats:

I was the Project Lead on Hack ‘n’ Slash. That’s the title that we use at Double Fine, which means that I was the person who came up with the idea originally, and then also was responsible for all of the high-level decision making both on the production side - you know, which things we actually chose to build - and then also being responsible for the overall high-level design ... I was functionally the Lead Designer in the sense that I was responsible for all the mechanical design and all of the puzzle
design that was in it, and then I was also the Lead Programmer, because I built most of the actual hacking mechanics that existed there, and then I was also the Lead Writer as well. (B. Dillon, interview, August 7, 2015)

With such a long history in the commercial games sector, Dillon was initially surprised that I would consider Hack ‘n’ Slash (2014) for inclusion in my study, since he had not intended to develop an educational game. During our interview, however, he conceded that he had in fact developed the game with a sort of curriculum in mind, although no approved curriculum for hacking exists. For Dillon, the player experience was what he considered first when designing the game’s action and text components. While he recognised that it might be easier to gain traction with players by presenting them with a series of carefully graded puzzles, he was more interested in confronting them with a puzzle that seemed almost impossible but which, once solved, would give them a real sense of accomplishment. It is this commitment to presenting the player with a smaller number of tougher puzzles that kept the game to a relatively short 4-6 hour experience. This is something that he acknowledges might be a potential limitation to its popularity, but which he believes is actually its greatest strength. It is also one of the things about the game that makes it such an intriguing choice for classroom use.

Erin Eldridge had no experience as a game writer before working on Hack ‘n’ Slash (2014). Trained as an aerospace engineer, when she was approached by Dillon, an old friend, to work on the game, she was developing software for NASA. At the time of our interview, she was leading a software team to facilitate rendezvous and docking with various objects on the International Space Station. With such a hectic schedule, she worked on Hack ‘n’ Slash (2014) as a favour to Dillon, writing after hours. Working from Houston, she read Dillon’s scripts, and added dialogue that she felt would successfully convey the mood he was trying to achieve:

[Dillon] had an outline of the plot that he wanted for the game, to kind of hold together the puzzles, and explore some of the themes, and so that’s what I tried to do. I filled in the outline, and I contributed in small ways here and there to the plot, and really tried to make it feel like a Double Fine game, to bring the laughter and bring some kind of compelling force to it. (E. Eldridge, interview, August 25, 2015)
8.1 Games as Action

8.1.1 Actions

In *Hack ‘n’ Slash* (2014), the player takes on the role of Alice, a young girl in the model of Nintendo’s famous elf Link, protagonist of the *Zelda™* series. Alice, it turns out, has the ability to see some of the code behind the world in which she is living. This ability brings her into conflict with an evil (or at least power-hungry) wizard. As the player travels around the world, he/she must hack real computer code to reconfigure the environment and its inhabitants in order to gain access to hidden areas and magical items that will assist them to achieve their objectives and solve the various quests on their way to rescuing a princess. In this way, the game represents an interesting cross-over between a traditional Adventure game of the past (the sort of game that would now be considered retro, and would be made available on the newest generation of consoles via an emulator) and contemporary games, in which the player has a lot of control over the actions of the characters and the game’s environment.

The actions required of the player in *Hack ‘n’ Slash* (2014) are reminiscent of the simple controls required for isometric games of the 1980s. The game is set on a series of maps, which move as the protagonist moves over them, giving the impression that they are roaming a relatively large world that has been sewn together from smaller segments. The
sense of spatial immersion is created within this game through the use of high contrast colour visuals and catchy music. The game is clearly not designed to feel realistic. Instead, it feels very stylised. This fits with one of the major themes of the game: *Hack ‘n’ Slash* (2014) is not designed to wash over the player; instead, the player is invited to take a much more active role in constructing the game, in the hope that they will become engrossed as they change the world around them. Within the challenges, these simple actions can be combined in myriad ways so that it would be possible for numerous players to complete at least some of the puzzles in different ways. It is possible to complete tasks in a different order although, once a particular area is complete, the player moves out of this map and into the map for the next level, meaning that there is a limit to the distance they can travel backwards physically. For the designers, it was essential that the player kept experiencing the sense that the game was working against them, so that the challenges would remain fresh, and the learning would remain relevant:

> We always had to figure out ... you have all of those tools at your disposal, so what’s the next challenge that we can present to the player in order to make them feel [like they are] constantly ascending this ladder of these clever transformations that are allowing them to successively take control over different parts of the game? (B. Dillon, interview, August 7, 2015)

![Figure 22. Alice finds her USB sword (Double Fine Productions, 2014)](image)

While much of *Hack ‘n’ Slash* (2014) is presented through action, there are nevertheless a range of written elements that must be understood in order to enjoy the game
fully. The clearest example is that all dialogue, via which the characters’ motivations as well as many elements of the story are presented, is conveyed through speech bubbles. In addition, signs and other placards strewn around the game reveal written instructions which - once understood - will become clues to solving puzzles. Finally, even when they are not engaging with a language-based puzzle, the player must differentiate between irrelevant and potentially relevant words within the code that dictates the behaviour of the game world and its inhabitants. If they want to change the way that a creature or object behaves, they must comb through a few lines of code and choose the right variables to change in order to achieve the desired effect. To keep the player motivated within the often-tough challenges, the team used humour. Dillon, suggests that humour was key to building a bridge between players’ engagement and their understanding of the game world:

In playtesting ... people were amused by the dialogue of the game, and then realised that the thing that they thought was funny about it was actually the key to solving the next puzzle; that’s when I felt like we did a really good job. It was something that sort of sparked your interest narratively in the experience, but also gave you the key to the next thing that you wanted to try. (B. Dillon, interview, August 7, 2015)

8.1.2 Design

In Hack ‘n’ Slash (2014), almost every element on screen can be manipulated in some way by the player if he or she wishes. When they enter the game, the player is given a standard avatar, Alice, but can choose their own name for her, as well as the name of their sidekick, which is preset to Bob. The game is set in a fictitious, magical landscape, populated with creatures which are set to attack the player upon contact, including birds and turtles. Many of these creatures are, however, vulnerable to attack using the power of hacking, after which the player can redesign their variables in such a way that their behaviour changes. In some cases, such a change will merely be an amusing distraction; in others, it will be the key to solving a puzzle. The game’s environments are similarly vulnerable, with blocks able to be moved and toxic waste spills magically cleaned up through the use of (re-)programming, giving the player access to previously inaccessible areas of the game world.

In keeping with the game’s focus on allowing for the customisation of code, players are encouraged to create their own modifications (mods), or download them from the Steam community, through which the game is sold. These mods change the base code of the game, and can be used to alter almost any aspect of the game, from small things such as the font in which dialogue is presented, to the physical appearance of characters and other objects, to translating all text into another language (users appear to have created translations for
German and Italian at the time of writing). For the game’s creator, giving the player control over the game’s design elements means more than just having fun – it has ethical dimensions that he wants the player to consider as well:

You can take advantage of that to exploit it and do things that you shouldn’t be able to do, and then that potentially puts it in territory where it’s not okay, but fundamentally that act is just an act of creativity. And that’s a thing that I personally value: being creative can absolutely be part of your personal identity and a positive part of your contribution to society. (B. Dillon, interview, August 7, 2015)

Allowing the player to choose the actions they took had to be about more than pretending to allow them control; the changes they made to the world had to be real and lasting. This meant giving the player access not to a mock-up of the variables that govern the behaviour of assets within the game; it meant giving them access to the assets’ code itself. As proud as he is of the final result, it has proved problematic from a coding standpoint:

You can manipulate any of the variables, including ones that might be completely unrelated to what you’re trying to do. You can modify things in ways that actually cause things to crash! (B. Dillon, interview, August 7, 2015)

Because it was not designed to be an educational game, at the time of publishing, Hack ‘n’ Slash (2014) did not offer support for teachers who might wish to use the game in class. Assistance for players took the form of the Support page provided by the publisher, known as the Double Fine Action Forums Community. The sort of support offered on this
forum included Frequently Asked Questions and Known Bugs, with discussion about the game itself to be found on a more general board within the Community as well as on social media. An examination of the forums on both the Steam Community and Double Fine (the game’s publisher) reveals that players are engaged in dialogue with each other about what they liked and did not like about the game, solutions they found to the various puzzles, bugs and fixes they have found, and mods they have created.

8.1.3 Situations

*Hack ‘n’ Slash* (2014) is set in a fantasy game world and contains recognisable fantasy locales such as dungeons, caves, fields and lakes, each of which presents its own challenges for the player to navigate. It is designed to be played on computer, with the character moving through the screen to travel from one part of the map to the next, and game objects, such as weapons and other inventory items, sitting at the bottom right-hand side of the screen, while the player’s health (a number of hearts) is shown on the bottom left. This game is designed to support a single player who is nevertheless connected to other players via the Steam Community, through which the game is sold. This is a game that is designed to be shared.

In *Hack ‘n’ Slash* (2014), NPCs can be either friend or foe, or both. The evil wizard is clearly a foe, while Alice’s sidekick Bob does his best to help out and is therefore considered a friend, even if his suggestions are occasionally unhelpful. In the broader sense, non-players include members of the broader *Hack ‘n’ Slash*-playing community, with whom accomplishments and frustrations, as well as strategies for solving puzzles and even modifications to the game’s underlying code, can be shared. While it is possible to play this game without creating or referring to paraxtexts, reading any of the advertising material as well as the conversations on community forums relating to the game, reveals that this would be a limited way of playing. With such scope for players to alter any aspect of the game they desire, they can move beyond the role of consumer and become a co-creator. Dillon stressed the importance of collaboration when playing a game such as this:

> Any adventure game is better played with other people, because it basically, adventure games are also about getting stuck, and thinking of something clever that allows you to resolve the situation ... It’s one of these things that deepens your appreciation for someone else for them to have looked at something in a totally different way and arrived at an answer that you just were not going to get to. (B. Dillon, interview, August 7, 2015)
On first glance, *Hack ‘n’ Slash* (2014) does not look like it has the status of an educational game. There are no endorsements from reputable educational institutions (currently), and no curriculum links. As aforementioned, until he was contacted for this study, Dillon had underestimated the game’s educational potential, stating:

> Oh, I had never actually considered [creating worksheets for teachers to accompany the game] [laughs]. I mean, it’s another manifestation of my naivety when it comes to this stuff, but that sounds cool to me too. I’m not aware of anybody who’s [doing that]. We had a handful of people who reached out to us to get educational licences to put it in computer labs and stuff so they could play it, but I don’t know if anybody’s actually tried to map a curriculum to it. (B. Dillon, interview, August 7, 2015)

While the game may not have educational credentials, however, it has something that many students may respond to more enthusiastically: it has the status of a ‘real’ game, complete with appealing graphics, engaging language, and a gaming community (who are not from the educational arena).

### 8.2 Games as Text

#### 8.2.1 Knowledge about games

*Hack ‘n’ Slash* (2014) would not exist without the Adventure games of the 1980s and 90s, particularly the *Zelda™* series. The game’s creator was quick to acknowledge the influence of classic Adventure titles on the game’s design:

> [The premise of the game] totally borrows the trope in every *Zelda* game that there’s an evil wizard that you’re ultimately trying to topple, but instead of being something where the wizard is being an adversary … he is always sort of surprised and perturbed by the things that you’ve done. (B. Dillon, interview, August 7, 2015)

The protagonist, an elf named Alice, must explore a broken world, and use her powers and the technology at her disposal to (re)make the world right. Along the way, she will make friends and allies, confront the world’s greatest villain and his henchmen, and rescue a princess. While the set-up of the game might initially seem familiar (to older players, at least), what the player must do with these items is unique, and actually serves to challenge stereotypical genre expectations: the sword is used for hacking, an orb for resetting the game to an earlier state, another item to seeing through the walls and other items, and another mode allowing the player access to the game’s underlying programming. In this way, the Adventure genre should be viewed as the game’s springboard with its actual genre quite difficult to
classify. For Eldridge, understanding and playing with tropes allows the writer to play with their expectations:

We stuck comfortably close to a number of tropes, on purpose, just to keep the game grounded in something familiar. [But] there are some reverse tropes. (E. Eldridge, interview, August 25, 2015)

The game is presented from an isometric perspective, giving the player an omniscient view of Alice’s surrounds and the challenges that await her. As the point-of-view character, however, Alice is not characterised in depth, with her actions defining her character. Throughout the game, she is provided with little information about the world, and she must learn about the abilities that each piece of equipment gives her in situ, including in the heat of battle. Rather than running into her nemesis, Christo, throughout the game, the despotic wizard is depicted in his own cut-scenes. As she travels around the game world, Alice meets NPCs who help her to understand the damage wrought by the evil wizard through his hacking of the world, and who alert Alice to the presence of a kidnapped princess who must be rescued for the game to be completed.

While there are clues about Alice’s real identity and the way that the world works throughout the game, it is only in the denoument that the princess reveals the truth about the relationship between Christo, her father, herself, and Alice, amongst others, in a twist ending. It is at this point that plot and the player’s mastery come together in a satisfying conclusion. For Eldridge, the characters took the game out of the realm of a simple Adventure or Puzzle game, and hint at deeper concepts and themes:

The main antagonist, Christo the Wizard, has actually kind of a tragic arc ... where he was trying to do a good thing and some bad stuff happened and he ended up saying, ‘For the good of everything, I’ll do this dark stuff,’ and by the time you actually see him in the game, he’s a caricature of a villain. (E. Eldridge, interview, August 25, 2015)
The game is underpinned by a strong ideology, which becomes clear as the player progresses through the levels. The explicit ideology asks the player to question not only the notion of good and evil, since any creature can be hacked and turned from an enemy to an ally with relative ease; but to question the amount of responsibility that one should take for a world and its inhabitants if one has complete power over them. The implicit ideology, meanwhile, mirrors the explicit message of the game: as the player progresses, he/she is given greater hacking ability; with this, he/she must choose how to use their own increasing power to influence the game’s narrative and, beyond the game, other games and computer programs with which they will come into contact. Dillon addressed the issue of whether teaching players to hack is morally correct by stating:

When we were first starting to talk about Hack ‘n’ Slash, [the potentially negative connotations of ‘cheating’ within hacking] hadn’t actually even occurred to me. I guess it had been such a fundamental part of what my personal identity, and having a little bit of a hacker’s view was something that I carried with me for a long time ... The point of learning how to become a hacker is not so that you can express your dominion over the world, it’s actually so that you can understand it more deeply, and understand all of the nuance and frailty of it ... The outcome for winning the game is not that you become the new ruler of the kingdom or anything like that, but actually that you open up this stuff so that it’s accessible to everyone. (B. Dillon, interview, August 7, 2015)
Hack ‘n’ Slash (2014) was created, in large part, to promote the analysis of games themselves. By taking on the role of Alice, and practicing the skills she requires to navigate her way around the game world and complete the puzzles set for her, the player is encouraged to see games as a construction, created by designers, which is open to redesign by those who understand and can manipulate the underlying code. Dillon highlighted how crucial he believes that establishing the sense of authenticity was for conveying the game’s fundamental message:

Late in the game, you crash the game all the time, ‘cause you’re manipulating the codes and stuff like that. But it was really important to me, because I felt like it would undercut those moments where you really felt powerful, like you had gained a deep understanding about something, and the fact that it can change in the way that you intended it to, if it was an abstraction of the experience as opposed to actually being a thing that you were doing. (B. Dillon, interview, August 7, 2015)

Despite the power handed over to the player during the game, the writers worked hard to keep the game’s narrative intact, even if the game’s environment and code were to break. They achieved this by making sure that all the challenges remained linked to the world of the game, supplying the narrative with internal consistency:

We tried to make the game as self-contained as possible. In one way, you could totally imagine a game like this having four wall-breaking puzzles where to get the solution to the password that you have to enter, you have to open a task file hidden in the game’s archive or something like that to progress. I was really resistant to doing that because I felt like it broke the fiction of the game, that there was this character that was experiencing this thing. I wanted the hacking mechanics to feel like the physics of the world that you were in, like these things that you were manipulating were the fundamental intrinsic blocks of the thing that made this universe that your character was living in. (B. Dillon, interview, August 7, 2015)

8.2.2 World around the game

Within a broader context in which STEM and more specifically programming is being promoted at high school, particularly with girls, in an attempt to increase the number of students who want to undertake the Sciences at tertiary level, the game’s identity as a mainstream game, rather than an explicitly educational title, may lessen the number of teachers who consider it a suitable tool for engendering enthusiasm for STEM in their students. Dillon would like to empower players by allowing them to not only understand, but manipulate, code. However, he does not necessarily believe that a player needs to be able to write code in order to experience this sense of empowerment:

There is no actual code writing in Hack ‘n’ Slash. There’s plenty of code you can read and manipulate, but it exists. The act that you’re performing is more of an act of
analysis and manipulation than it is of the creative act of building an algorithm to begin with. I have opinions about the value of that relative to other things. I don’t know how that actually gets incorporated into a curriculum where you get people excited about STEM, but I just kind of have this belief that, I guess to be pithy: I don’t think that every child should learn how to code, but I think every child should learn how to hack. (B. Dillon, interview, August 7, 2015)

8.2.3 Me as games player

As a single-player, browser-based game, *Hack ‘n’ Slash* (2014) does not require the player to be physically present in the game. No other real people are represented in the game, however the player may engage face-to-face with other players if he/she chooses to play the game as one member of a pair or a group, in order to discuss strategy. The player may also choose to interact with other players via social media in order to share resources.

Because it was designed to appeal to players of a wide range of ages and experience with hacking, *Hack ‘n’ Slash* (2014) must introduce players to mechanical and narrative elements in a logical and timely manner. This allows the greatest number of players to progress through various levels without giving up prematurely. With subversive humour at its core, the player is invited not only to take on the role of a female elf, but that of a hacker as well, whose job it is to bend and even break the rules of the game world. For players who are really inspired by having this capacity, they can use the game’s underlying source code to change the way the game world looks and sounds, and the way that its characters behave and speak. As such, the game invites the player to actively resist the identity imposed upon them and to forge a new identity both within and outside of the game. It was this identification between player and protagonist that Dillon and Eldridge attempted to exploit in order to convince non-hackers that they, too, could master the game:

I think the real intent, and this is coming forward from [Dillon]’s descriptions of the character and what he wanted her to be, since we’re trying to sort of … take the player through this experience of learning hacking, which is not an easy thing to learn … It’s kind of like algebra [in that] it’s believed, by people who haven’t done it, to be this magical, scary, impossible thing, when it has its difficulties, but it’s something people can do, and people do. It’s reasonably easy to learn. By having the protagonist be confident and comfortable in the world, and even bratty or overconfident, as she comes up against these challenges, I think it just helps to enable the player like, ‘Oh, Alice thinks this can be done; this can be done.’ (E. Eldridge, interview, August 25, 2015)

8.2.4 Learning through games

The game does not relate to a set curriculum, relying instead upon a set of guidelines generated by the game’s creators to allow the player to experience an authentic learning curve.
in relation to their hacking that will allow them to develop mastery of relevant skills during the course of the game. For Dillon, this was the first time he had developed a game that actually set out to ‘teach’ the player something explicit. This meant that his views on what education entails for a player are refreshingly honest and off-the-cuff for somebody steeped in the literature surrounding pedagogy:

Most games that I’ve worked on have not been that, right? Like, you know, it’s just been sort of like, ‘We’ll tutorialise the mechanic for you pretty quickly and then you’ll just practice that mechanic.’ But I guess to speak to the stuff that I have found personally valuable when working on this game, I think that the key is really … understanding the experience that you’re putting [the player] in, and trying to imagine the things that they could use in order to learn the thing that you’re trying to teach them. (B. Dillon, interview, August 7, 2015)

In order to be successful in Hack ‘n’ Slash (2014), the player must change the game world, a process of deconstruction and reconstruction through which the knowledge that is usually stored behind the user interface is laid bare and the role of designer is demystified. By promoting the use of mods, the game’s creators have reinforced the value not just of playing a game, but of making (or in this case re-making) a game. By presenting players with puzzles that can only be completed by fully understanding the purpose of the original design process and then altering this to serve their own needs, the designers have inadvertently created a game that also promotes metacognition. For Dillon, it has been fascinating to watch the response of young people playing the game, particularly because he has seen them begin to question their own understandings of what constitutes learning:

It wasn’t until afterwards, when the game was released and kids were playing it and getting excited about programming and that kind of stuff, where I was like, ‘Oh!’ I had this sort of emotional core that I wanted to capture in the experience, but sort of accidentally stumbled into a space where we were making a game that actually taught people about cheating and hacking, and examining these things on a more systematic level. (B. Dillon, interview, August 7, 2015)

8.3 Summary

Hack ‘n’ Slash (2014) is designed to provide the player with an experience that is both entertaining and intellectually stimulating. It uses tropes that would be familiar to anybody who has played fantasy games to introduce the player to a range of mind-bending puzzles and a rich exploration of the notions of good and evil. As their confidence grows and their programming skills increase, the game forces the player to shift from the role of reader to writer (or, in this case, designer) as they redesign the game world both by interacting with the programming behind the game play elements. They are also encouraged to connect with
other players to create and share game mods and other paratexts within the broader Hack ‘n’ Slash (2014) community.

While it may be tempting to view Hack ‘n’ Slash (2014) as simply an exploration of game mechanics, giving the player this level of control ties into the themes of the game, which reveal the potential dangers, and benefits, of hacking, depending upon who wields the power. In this way, it could provide the basis for a detailed ethical inquiry within the classroom. The game was not designed for a school context and, as such, the educational aspects do not feel didactic but appear, instead, to arise quite naturally out of the gameplay itself.
CHAPTER 9: CASE STUDY 5, THE VIRTUAL DEMENTIA EXPERIENCE™

So, the technology is going to enrich that experience - amping it up - and I think that’s where we’re headed. But someone’s still gonna have to present that ‘Why do I give a damn?’ button to you. (M. Costello, interview, March 19, 2015)

The only virtual reality game to be analysed within this study, the Virtual Dementia Experience™ (2013) is an immersive, interactive virtual reality experience that is designed to allow the player (and, in the case of a group session, a roomful of observers) to experience what life is like for somebody living with dementia. Players are presented with two scenarios, one after another, the first of which shows what life can be like for somebody who is living with dementia when the people she lives with do not understand her condition. The next scenario is placed within the same setting, and contains the same two characters, but has a few key differences. These are due to improved understanding by those she lives with which make an enormous difference to her quality of life. After playing the game, I interviewed two of the game’s lead writers, Phoebe Lindsay and Kelly Burns from Alzheimer’s Australia Vic; and Project Lead/Designer Liam McGuire from Opaque Multimedia.

Lindsay was assigned to liaise between those writing the educational content and those developing the technology for the Virtual Dementia Experience™ (2013). She was attracted to the role because of her love for educational games, which she believes have the potential to greatly enhance traditional education for students of all ages. Having worked on the Virtual Dementia Experience™ (2013) for a number of years, she suggested that creativity is required to balance the narrative and educational demands of such a game in order to keep the player engaged.

Unlike Lindsay, Burns has a clinical nursing background, and has developed a number of courses for Alzheimer’s Australia Vic. As one of the course developers for the core content that sits at the heart of the Virtual Dementia Experience™ (2013), it was Burns’s job to translate the vision of Dr Tanya Petrovic, Business Manager for the organisation, and to make sure that this vision would be able to connect with the audience. Burns was also in charge of ensuring that this vision was successfully conveyed within the supplementary training materials that accompanied the experience, which were designed to be discussed with participants before and after they were exposed to the game.

McGuire’s background is quite different from that of Lindsay or Burns. McGuire trained in game design at university, including taking classes on writing game narratives, and has since lectured in game design. While he had worked on a number of projects in the health/education space before collaborating on the Virtual Dementia Experience™ (2013),
this was the first time he had worked on a narrative-driven digital educational game. McGuire worked as the Project Lead, Lead Designer/Researcher, and primary artist on the original *Virtual Dementia Experience™* (2013), which was installed in a purpose-built, immersive studio in Parkville, Victoria. When the decision was made to redevelop the *Virtual Dementia Experience™* (2013) for Virtual Reality headsets, McGuire supervised the visual artists who were given the task of creating the game’s artwork, and designed the more complex systems involved in the game’s construction.

9.1 Games as Action

9.1.1 Actions

The actions that the player can perform within the *Virtual Dementia Experience™* (2013) are very limited. The player is essentially put on rails as they move around the environment, and can only interact with specific items in limited ways, such as touching the taps to turn them on, or opening particular doors. As such, there is little choice in which actions to complete, and in what order, lessening the interactivity of the experience. In Scenario 1 (the negative version), the player is confronted by a number of antagonistic factors which could be said to constitute a player-against-the-computer dynamic. These include the nearly constant reminders by the protagonist’s daughter that the player needs to hurry up; the choice between doors, neither of which will ever lead to the desired location; and the threatening imagery, in the bathroom, of a hole into the abyss instead of a bath mat, and a scarcely dirty shower cubicle. Another example of the computer seeming to work against the player in this scenario is the inability for the player to stop, or step out of, the experience: they must continue it until the scenario ends. By giving them only limited interactivity, the game reinforces one of its themes, namely that the choices afforded to the dementia sufferer are (at least initially, in the negative condition) very limited. For Lindsay, one of the keys to engaging the player in the drama of the scenario was fostering a sense of confusion and disorientation:

Walking into the bathroom, and everything being white, and you’ve got to locate the toilet and the basin to clean your teeth, but you can’t locate anything because everything is white, and you can’t see any objects. So that confusion and disorientation. (P. Lindsay, interview, September 4, 2015)

In Scenario 2 (the positive version) the player is only allowed to do as much as in the previous scenario, but this time the limited interactivity is not designed to pit them against the
environment, but to experience instead what a supportive environment feels like. Because of this, there is a sense of working with the computer. For example, in Scenario 1, there was little written down for the player in the environment, while in Scenario 2 the player finds themselves surrounded by relevant signage, both written and graphical, which is designed to assist the dementia sufferer to more easily navigate the family home. Routines, for dementia sufferers, are essential, so the fact that the player cannot deviate from their set course is no longer seen as a threat.

This game has been designed to effectively remove much of the distance between player and protagonist by offering a high-fidelity recreation of a prototypical family home, and by giving the player full sensory immersion. The latter is achieved when it is presented either as part of a large audio-visual display which is designed to surround the player/s, or on the virtual screen of a VR headset. The game’s writers and developers suggest that, although effective, the Virtual Dementia Experience™ (2013), when presented within a purpose-built studio in Parkville, is still limited in the amount of immersion it can offer, because people in the audience are still aware that they are watching somebody else control the protagonist, and are listening to somebody standing off to the side who is reading a script. This is something that the team has been keen to rectify in the development of the virtual reality version.

McGuire explains:

> VR is essentially all about immersion. That’s the only thing that it has over traditional forms of gameplay, and the largest part of that is that it’s able to completely occupy your sensory inputs, and really lower the barrier of entry for suspension to disbelief ... it’s an incredibly important part of what makes the experience valuable. (L. McGuire, interview, September 15, 2015)
Figure 25. In Parkville, Australia, the audience sits in a purpose-built studio, watching on as a facilitator controls the game’s protagonist, Myrtle, using a Microsoft Kinect (Alzheimer’s Australia Vic, 2013)

9.1.2 Design

The design of the *Virtual Dementia Experience™* (2013) is entirely locked down, with the player given no choice in terms of character identity or manipulating the setting. The game does not allow the player to design an avatar. However, the fact that the game is told from the first-person perspective negates the need for avatar design, and effectively allows each player to become the central character without the need for this device. Despite this, the daughter does refer to the lead character as ‘mum’, making it clear that the protagonist is female. The decision to make the *Virtual Dementia Experience™* (2013) impervious to player design is in keeping with the underlying message of the game.

The *Virtual Dementia Experience™* (2013) was developed by course developers and writers who have extensive experience in educating health care professionals and the public about what it is like to live with dementia. As such, it represents the latest knowledge about the topic, and acts as part of a broader suite of educational materials that are presented, for those who register for a training programme, at Alzheimer’s Australia Vic. This organisation acts as a hub for providing ongoing support to programme participants as well as the broader community who are dealing with those who suffer from dementia.
Because the game, and the broader training of which it is part, is aimed at a broad audience, the sorts of support required for various sessions in which the game is played must differ. For health professionals, the team was satisfied with presenting the information bluntly, with a stark contrast between the ‘bad’ scenario and the ‘good’ one that follows. However, for consumers who may be caring for a loved one with dementia, the team makes sure that a counsellor is present, to offer support and create a safe learning journey. Equally important for all participants is the presence of one or more educators who can immediately answer questions that the participants have in response to playing the game. Formal reflection is deferred until the experience is over. However, reflection is built into the scenarios in that Scenario 2 acts as a foil for Scenario 1, providing the player with an example of what a repaired version of the previous scenario would look like. Reflections upon the experience can be shared with the wider group, in person, during the training programme of which this game forms one part. For contributor Kelly Burns, it is the reflection that takes place outside of the game, in the session afterwards, which turns attitude change into behaviour change:

That’s a really important component of the education: you might have been pissed off with the daughter, and you now understand what the person might be doing in the shower by resisting, but how will you change your behaviour as a result? So a lot of the education is you having a clipboard, and writing some reflections down: what are you going to do to change what you do? Practice improvement. (K. Burns, interview, October 27, 2015)

Both Burns and Lindsay described instances where health care workers had changed their practice and contacted Alzheimer’s Australia Vic to report their success. Lindsay pointed out:

People now understand how much the environment can impact on someone, because they’ve had to sit through that! And the blaring noise is so overwhelming. And they go back to their facility and go, ‘Oh my god, there’s a radio on, a TV on, we’re having a chat, there’s food trolleys going, it’s too much!’ and so they’ll cut out all of that stimuli, they’ll remove that extra noise, and they say they can see that affect immediately. People who have been rocking back and forth all of a sudden are sitting there smiling. That’s the difference. (P. Lindsay, interview, September 4, 2015)

9.1.3 Situations

The game world of the Virtual Dementia Experience™ (2013) is limited to just a few rooms within a family home, including a hallway and a bathroom. These are depicted from a first-person perspective, and take up the entirety of the screen. The game was originally designed to be a training aid for those who attended training at the Parkville campus of Alzheimer’s Australia Vic, but has since been ported to the Occulus Rift, which offers the
possibility of making the experience portable. This game is designed for a single player to interact with the world, either for the education of others (in the purpose-built immersive studio in Parkville) or individually (in the Virtual Reality version). In either case, player experiences, and their feelings while playing, are designed to be shared with other training participants and facilitators.

The *Virtual Dementia Experience™* (2013) relies upon the NPC of the protagonist’s daughter to create the sense of tension in Scenario 1 and to provide a contrasting example of understanding in Scenario 2. While she is not depicted visually, her voice is heard in the background, criticising the protagonist for her slowness in the first instance and encouraging her in the second. There are also hints of other non-players, however, in the family photographs that decorate the walls of the protagonist’s home. In terms of non-players in the real world, as aforementioned this game is designed to be played in groups, whether these groups are all watching on person play as in the sessions in the purpose-built studio in Parkville, or are sharing the same experience on their own VR headsets and then coming together to discuss and compare their impressions afterwards. Other non-players include the facilitators and even counsellors who attend these sessions and can help to shape and reframe the player’s experience.

Prior to beginning the game, it is expected that all players will have undertaken some form of training, including reading materials relating to dementia. They will be called upon to reflect upon the experience in sessions after gameplay and sharing some of their thoughts with others, meaning that they might be exposed to not only their own paratext (in the form of a written reflection) but many others within the training program. Whether it is played by one person as a performance on behalf of the group, or by individuals wearing virtual reality headsets, this game is designed to be played locally, within a clinical setting. The game’s designers, including staff at Alzheimer’s Australia Vic, were very clear about the type of immersion they wanted participants to feel, and even separated the game room from discussion rooms in order to preserve the sanctity of the game-play context.

The website for Alzheimer’s Australia serves as a model of how the educational status of a game can be enhanced by a well-organised institution. The website acts as a resource in itself for somebody who wants to know about the services the institution offers, and the research that supports their use. The page regarding the game itself is presented with clear imagery, a detailed description of the wider program, reference to the hundreds of people (including politicians) who have already experienced it, and testimonials proving this fact. There are also links to press releases that relate to the prizes the game has won, each of which
restates its value as an educational tool. According to Lindsay, the status of games like the *Virtual Dementia Experience™* (2013) may be increasing as public perceptions about the value of games for learning begins to change:

Traditionally, we think of video games as a waste of time ... we tend to have these, at least in my experience, bad notions around it ... but we spoke at PAX (Penny Arcade Expo, Melbourne) last year, on serious gaming and the history and the future of educational games, and that was incredible, hearing the different people on the panel and their experiences as well. We’re having a whole new realm of people coming through who are saying, ‘Yes! Educational games are great!’ (P. Lindsay, interview, September 4, 2015)

### 9.2 Games as Text

#### 9.2.1 Knowledge about games

The game’s protagonist is an aged parent who is living with dementia which, based upon her daughter’s statements, seems to be getting worse. The other major character is the daughter, whose voice can be heard in the background, spurring the player on, acting as a stressor in Scenario 1 and a support in Scenario 2. For Burns, a large part of the success of the game has been the fraught relationship between the parent and her grown daughter:

The way that the daughter speaks to Myrtle is a big factor in how people feel in that room, because some feel very disgusted. Some people feel that Myrtle is disempowered, and it takes the audience on that journey with the daughter and the mother. (K. Burns, interview, October 27, 2015)

The game is set within a suburban family home, which is large and fairly generic, but artworks and family photos on the walls give the place a sense of being lived in. There is only diegetic sound, the lack of music heightening the sense of realism. The *Virtual Dementia Experience™* (2013) is neither explicitly nor implicitly intertextual. However, for those familiar with game that require exploration through the use of environmental storytelling techniques, suggestions about the greater narrative at play in the life of the protagonist may provide another level of interest. For Lindsay, setting the game within the family home was key to creating empathy within the player. According to McGuire, one of the keys to creating a believable setting is attention to detail, which may never be explicitly referred to within the game but which nevertheless underpins the understanding of the design team:

One of the little elements we have scattered around the scene is that the paintings have been taken down by the husband, because he was redecorating the house and moving stuff around, and he’s forgotten and left them on the floor. He hasn’t thought about the other person’s context, what they might be seeing, and, as a result, your view of the world is altered. (L. McGuire, interview, September 15, 2015)
The *Virtual Dementia Experience™* (2013) utilises a simple structure, a narrow point of view, and short, linear timeframe to great effect. The narrative structure is very simple, with each scenario functioning as a single, self-contained Act; together, they form a diptych, with the same progression of events from introduction (entering the house) to complication (walking down the hall and being confronted by the two doors), and finally the climax (the bathroom scene).

The point of view adopted by the game is first-person, with the player immersed in the world of the protagonist; this is the same for a group watching somebody perform the game on a large screen, except that they are once removed from the immediacy of the experience. In terms of the narrative point of view, it is very narrow, with the player only shown the perspective, and perception, of the parent living with dementia. Choosing to show nobody else and to restrict the player’s view to just that of the dementia sufferer heightens the sense of claustrophobia the player feels when grappling with faulty perceptions of what should be a positive home environment. For the game’s creators, putting somebody in the shoes of somebody with dementia was an important outcome.

The *Virtual Dementia Experience™* (2013) is a simulation in which both the game play and narrative elements are minimal, as the player’s passivity is enforced to a significant degree and, therefore, each player’s actions are guaranteed to be quite similar. The game is linear, and takes place in a short timeframe, with each scenario taking approximately five minutes in total. There is only one break in time, which occurs when the protagonist is asked to take off their clothes, a minute or so of real-time action which is skipped to allow for the quicker transition into the shower cubicle. The effect of matching the play time to the time that the actions on screen would really take, heightens the sense of reality for the player.

### 9.2.2 World around the game

One of the business realities of creating the *Virtual Dementia Experience™* (2013) was accepting some budgetary limitations. The game was first envisaged by its creators as an experience that would take the player through a patient’s morning routine, from waking up and getting out of bed, to looking for their glasses, then going to the bathroom to shower and finally to the kitchen to make a cup of tea. However, this scenario was eventually shortened to include the person’s arrival at home, and walking down the hallway and into the bathroom, in both negative and positive versions. Rather than viewing the final product as lesser, however, McGuire points out some of the benefits of the more contained scenario:
It’s very easy to go, ‘Well, more is better,’ but we tried to take a very defined approach. Initially, we had an enormous list of all the different potential symptoms of dementia and aging and how they can combine, a massive, massive list, and maybe a quarter of them made it into the final thing. So we went through a vetting process of picking essentially the most impactful of those experiences, and the ones that we could actually work into a confined chunk of the environment, which was the living rooms, and the bathroom, together with a hallway for the wallpaper effect. (L. McGuire, interview, September 15, 2015)

While playing the game, different players will understand more or less about the experience of the dementia sufferer depending upon their level of experience with playing games. While all players should be able to infer, from the daughter’s dialogue, that the protagonist’s condition has worsened at an unforeseen rate and that this is causing the daughter stress, the experienced game player should be able to ‘read’ the environment itself, picking up clues about the sort of family life the protagonist had before dementia became such a big part of her life. With the game designed to be experienced as part of a training session, written and spoken responses to the game play are required from all participants, meaning that these observations can be shared between players. According to Lindsay, the response to the game, from health care professionals and family members caring for a loved one with dementia, has been overwhelmingly positive, particularly in creating a bond between participants:

The response that we’ve had from people is just unbelievable. We’ve had great responses from our other education services, especially the more long-term services … when a relationship’s built up between a class and with a teacher [over a longer period of time]. But most of the time, we only have people here for a few hours. We only have access to people, to provide that education, for a very brief period in time, and so this we’ve only got two hours [to attempt to] build that same connection. (P. Lindsay, interview, September 4, 2015)

As one of the few narrative-driven digital educational games within the dementia treatment area, the game has faced some challenges in gaining widespread acceptance as an alternative, or addendum, to more traditional forms of Health training. Since its release, however, it has garnered major prizes, and has been used by a wide range of people including those in the health area as well as politicians, suggesting that its may overcome conservatism within the industry.

9.2.3 Me as games player

The Virtual Dementia Experience™ (2013) is designed to hook the player through the use of immersive technology and a first-person perspective which helps to bring a very
personal narrative to life. The rising tension within Scenario 1 conveys a sense of drama, and may engender the player with feelings of sympathy, and ultimately empathy, for the plight of the protagonist. When the bad scenario ends and the good scenario begins, there is a sense of healing that is conveyed to the player as the environment is rendered more accessible. After the game session has ended, the player is invited to reflect upon the experience within the associated training session, while the empathy developed during the session offers him/her a lever to explore better ways of treating those who are living with dementia. For the game’s designers, the key to fostering engagement and reflection was getting the player to experience the emotions associated with somebody experiencing dementia. However, finding the balance between engaging the player and scaring them or putting them off altogether was a challenge:

We don’t want it to be so horrible that people walk out of this going, ‘Oh my god! This is the end of the world!’ but we want them to understand that for some people this is their day-to-day life. So by experiencing that fear and confusion, and the distrust and everything else that goes with it, that’s what builds the empathy later. (P. Lindsay, interview, September 4, 2015)

This sentiment was echoed by Liam McGuire. When Opaque Multimedia teamed up with Alzheimer’s Australia Vic to develop the game, they initially found it difficult to reconcile what appeared to be two very distinct messages within the brief:

We’re coming in and saying essentially, ‘Dementia is awful, but there’s something we can do about it,’ and really try to communicate those two sentiments in equal measure was a pretty challenging thing, because if you do one but not the other, then you’re not going to have impact. If you say, ‘There are things you can do to solve dementia’ and your view is just people forgetting where they put their glasses, [you get] no impact. If you say, ‘Dementia is awful’ and people don’t get the second part, then you’ve potentially just damaged carers and potentially made them not even want to be carers anymore. (L. McGuire, interview, September 15, 2015)

9.2.4 Learning through games

When designing the Virtual Dementia Experience™ (2013), the team used an existing curriculum developed in-house, entitled Experiencing Dementia, as a starting point. They chose to realise the educational aims of the programme through the use of a scenario that would introduce players to striking moments in the life of somebody suffering from dementia, all of which were based upon their research. The resulting game clearly fits the mold of a serious game: it requires the player to engage in a scenario which is true to life in order to assist them to develop knowledge and skills that may - in the best case scenario - have a direct impact upon the participant’s own practice, particularly in the case of health
workers. For Burns, it is the potential impact upon behaviour that is the key to judging the game’s effectiveness:

What I wanted to see was making sure that the people who are experiencing were really seeing dementia, but also I needed it to translate and be practical when they return to their workplace. So [if] we come away from the [Virtual Dementia Experience™], just watching that and creating empathy, is not enough. What do you do with that [empathy]? And how are you going to take that back to your workplace, and how is that going to make a difference for the people you work for? (K. Burns, interview, October 27, 2015)

While the experience of playing or watching the game may have an emotional impact upon the player/viewer, those responsible for the game’s creation suggest that greater learning takes place within the training sessions that surround game play, as facilitators work with players to understand how their choices can affect dementia sufferers. With a focus on creating impact within the workplace, the game has been embedded within a training programme in which the applicability of in-game experiences can be discussed in depth. For the game’s designers, the ultimate aim was to see participants leaving the session as more versatile problem-solvers, a skill that can translate to any clinical setting:

That idea really to me is about problem-solving, not trying to find a checkbox that you can check off, which is what tends to happen at the moment. That’s sort of the approach that we see in education at the moment: a lot of university students will come in and basically they aren’t able to take the initiative on a creative project, because they need a clearly defined scope and problem form, they’re unable to go and find the form and solve it. That’s the kind of thing that the [Virtual Dementia Experience™] is trying to teach you, is the important of doing this can have this much of an impact on somebody by doing simple little things like this. If you can project and understand them, you’re going to make their life substantially better. (L. McGuire, interview, September 15, 2015)

9.3 Summary

The Virtual Dementia Experience™ (2013) explores what life looks like when seeing through the eyes of somebody living with dementia. By extension, it explores the impact upon the other people in the dementia sufferer’s life, such as their family members. The use of an everyday location, as well as small personal details such as family photos on the walls, are designed to strengthen the reality of the situation and heighten the player’s empathy for the dementia-sufferer. Increased empathy for the protagonist creates a deeper sense of immersion, and heightens the sense of helplessness when ultimate control over one’s in-game actions become compromised.

It is likely that, in the first condition, when the protagonist is being shouted at by their daughter, the player/learner might experience stress as they attempt to make the right move,
only to be confronted by unpredictable or even scary consequences. It is only once the game is reset and put in the more positive mode that the player is able to achieve success, which is intended to drive home the message that ‘winning’ is outside the control of the player; instead, the ability to create conditions for success lie with those who are not afflicted with dementia. For learners, then, who have the ability to lessen the stress that a dementia-sufferer faces on a daily basis, the lesson is two-fold. This lesson, and the player’s emotional response to it, can be managed within the context of the in-class reflection following play. By requiring the player to walk in the shoes of the protagonist, it is hoped that the game will ultimately lead not only to a change in attitude, but in behaviour, when the trainee re-enters their home or workplace.
CHAPTER 10: DISCUSSION

My philosophy is you have to learn to let go as a writer. I know a number of games that have a very strong, linear storyline, but not many people talk about the story. But, at the same time, I know a lot of games that are much more open-world, where the player is given a lot of system tools to play around with, and they can’t stop talking about what their character did … The more options they’re given, the more tales they can share. (C. Avellone, interview, July 1, 2015)

As a learner, author, teacher, and educational game writer, I have experienced the transformative power of narrative within the classroom. This thesis was designed to explore the complexities of writing narrative-driven digital educational games, and to recognise the contribution of those who perform the task well. What distinguishes this inquiry from many before it is the attention I have paid to the role of the writer in this process. By talking to experts in the field, examining relevant literature, analysing best practice games of this nature, and interviewing those responsible for writing these games, I have sought to understand the complex process involved in creating games that worked educationally, mechanically, and narratively. These findings will be discussed in detail in sections 10.1-10.5, which seek to generate an answer to the question that sits at the heart of the inquiry, namely ‘How can the writers of narrative-driven digital educational games improve these games’ potential effectiveness using action and textual elements?’

Before attempting to answer this question, however, it is important to consider what the journey undertaken within this thesis has revealed about what constitutes a ‘writer’ of games. Is the writer somebody who writes the words upon which everything is based, the final arbiter of what is acceptable within the game world, or is he or she just one member of a creative team who together manage to bring the game into existence? The answer, according to the Key Informants and the game writers interviewed, is that it depends upon the writer/s, the project, the financial and logistical realities of the project, and the rest of the team. Some writers, like Chris Avellone and Matt Costello, are experienced in writing prose fiction, and can build a story world from their own imagination; Veronika Megler, Chris Avellone and Matt Costello have used much-loved pre-existing source material as a springboard for new game concepts; while a writer like Nick Fortugno seems less concerned with developing a ‘rich’ narrative than with creating a game that functions mechanically first from which the events of a story will emerge. The extent to which these experts have collaborated to develop narrative elements has depended entirely upon the project, with Costello taking on a writing partner for certain games, and Fortugno working with a group of kids who conducting research, then created appropriate characters and events.
Similarly, within the case studies, the role of the ‘writer’ looked different depending upon the demands of, and the resources available for, the project. Dr Jeremy Friedberg worked with a writing partner to create *History of Biology* (2010). The writers from Pixelberry Studios, who were responsible for writing quests for *High School Story* (2012), suggested that they had to actively avoid feeling like they owned any of the characters in the game, since these characters’ stories could be written, or re-written, by any writer within the broader team, and contributed to by other staff. Jeppe Herlev Nielsen, the lead writer on *Global Conflicts: Afghanistan* (2014), seemed to view his role as both a creative and a practical one, in which it was his task to bring as much learning and entertainment to the design of the game as the ever-tightening budgets would allow. A veteran of the games industry, Brandon Dillon was the creative mastermind behind *Hack ‘n’ Slash* (2014), but hired a writer who, he knew, would bring a much-needed sense of humour to the game’s dialogue; this was particularly necessary since, as an independent game designer, he was required to undertake so many other tasks on the project. Perhaps the greatest illustration of the complexities with trying to identify the writer of a narrative-driven digital educational game such as those chosen for this study was illustrated by the team responsible for the construction of the *Virtual Dementia Experience™* (2013). They came to the project from different professions, and with vastly different levels of experience in storytelling and game design. When interviewing this multi-disciplinary team, it was impossible for me to discern which team member had been responsible for precisely which aspects of the game’s narrative design, but this process worked to produce a coherent game that achieves both its narrative and educational aims.

Ultimately, it may not be possible to establish exactly what a narrative-driven digital educational game writer looks like in all contexts. This lack of specificity, and predictability, is one of the aspects that makes the role so challenging.

10.1 What can expert writers tell us about the complex nature of writing for games?

Prior to analysing the five case studies included in Study 2, I spent months interviewing Key Informants. These experts, all of whom had extensive experience in writing mainstream and, in some cases, educational games, described some of the reasons that players play games, including challenge, enjoyment, frivolity and immersion. They noted that no single motivator is going to work if that is all a player is offered; it is the balance of these gameplay elements that makes a game fun, a suggestion in keeping with the “4 Keys 2 Fun” proposed by Lazzaro (2009). Like Lazzaro, Fortugno spoke about the distinction between
light or forgiving challenges and difficult or demanding challenges, and suggested that either
can be satisfying so long as the difficulty of the challenge matches the player’s expectations
and desires when playing the game. Fortugno went further, suggesting that, if there is no
challenge, there is no game. He also highlighted the crucial link between challenge and fun.

The key informants spoke about some of their struggles in writing interactive stories,
including compensating for branching stories, as well as for players going off-script, thereby
potentially undoing many months of work in preparing pre-scripted scenarios which would
deliver the same emotional impact to all players. However, while recognising the challenge
of such an outcome, all were quick to point out the benefits for players, suggesting that it is
their capacity to change a game that fosters a player’s sense of ownership. Chris Avellone
suggested that, even with a handful of tools and a sandbox, players can construct something
that is very meaningful to them. He suggested that this might in fact allow players to have the
most fun, and made it clear that fun should be a guiding principle for the designer when they
are choosing how much control they should offer to, or withhold from, the player over what
happens to the game world.

Ironically, considering that it was created before the games written by the other key
informants, Veronika M. Megler’s work on *The Hobbit* (1982) provided players with some of
the most open storytelling. When she was brought on to adapt Tolkien’s novel into a
satisfying dungeon crawler in the early 1980’s, Megler did not attempt to prescribe the
player’s story trajectory; instead, she gave the player free reign to explore the world of *The
Hobbit* (1982) and to interact with its inhabitants in any way that they saw fit. By doing so,
she allowed players to do things that she, as the writer, could never have predicted they
would do, some of which were highly successful and entertaining, even leading to the
creation of fan-generated paratexts that would offer unique solutions to the game’s puzzles.

In an era when players appear to be demanding more choice within, and control over,
the game world, it might be tempting to view the role of the writer as less central to the game
play process. I would argue, however, that in these “spaces ripe with narrative possibility”
(Jenkins, 2004, p. 119), the experts’ perspectives simply serve to highlight the complex
interplay between writer and player in which the balance must be found between offering too
much choice and too little, too much control and too little, to achieve the perfect balance, and
allow the player to take on the role of both ‘reader’ and ‘writer’ at different times.

All four expert game writers were enthusiastic about the potential for digital
educational games to enhance learning. For Veronika M. Megler, the greatest potential of
such games is that they allow the student to learn from mistakes, their own and those of other
people, which will allow students to develop behaviours and strategies that allow them to recover from mistakes. Matt Costello, who cut his teeth in educational game design while working for Disney, was particularly enthusiastic about these games’ potential to offer more immersive experiences for students through Augmented and Virtual Reality, technologies that Chris Avellone was also excited to see used in this arena. While three experts expressed their admiration for those who write narrative-driven digital educational games, because of the potential conflict between giving players a satisfying learning experience and a satisfying gaming experience, Nick Fortugno pointed out that fun and learning do not have to be mutually exclusive. In fact, he pointed out that, in a technical sense, games must always teach the player if the player is going to successfully progress through the game, an assertion that is in keeping with Koster (2013), for whom learning is central to a working definition of fun.

Within my conversation with Costello, he expressed the view that, even with major studio backing, an educational game might never end up making a profit, while Fortugno’s foray into educational games was as part of a project that was funded specifically to educate young students in game analysis and design. Their experiences, then, serve to reinforce the claims of educational game designers, who pointed out that educational game design companies are often limited by the amount of funding available and the willingness for the end user to pay for their product.

10.2 What does the existing academic literature suggest about the effectiveness of narrative-driven digital educational games as educational tools?

Digital games are currently viewed, by many within the field of education, as a way to engage and motivate students, and to assist them in acquiring content knowledge and skills. Despite the growing interest in using digital games, including serious games, when I began this course of study a large-scale review which sought to draw together findings from the empirical literature was yet to be undertaken. Study 1, a critical review of the literature, sought to explore what others had discovered about the effectiveness of narrative-driven digital educational games. Within the context of this review, I did not impose my own definition of effectiveness upon the findings, allowing, instead, those who conducted each of the studies included within the analysis to determine how they defined effectiveness.

Of the 130 articles synthesised in the final review, most included suggested that narrative-driven, digital educational games can be at least partially effective in achieving their educational aims, with 62.3% of studies reporting that the game/s they tested met all their intended educational outcomes, and a further 33.8% suggesting that games achieved at
least some of their intended outcomes. The number of studies that reported negative findings (in which the game condition performed worse than a control group) was 2.3% of the total; while 1.5% of studies reported on games that showed no effect beyond that experienced by a control group.

These findings are more positive than those of Ke (2009), who determined 52.3% of studies were effective, 26.2% were mixed, 1.5% were negative, and 18.5% showed no difference above the control condition. The two biggest differences between my review and Ke’s qualitative meta-analysis are in the number of studies determined to be effective and to have shown no difference from the control. I would account for these discrepancies by pointing out that, in my review, I accepted any study as effective if it reported positive results that exceeded those of the control group, even if the level of achievement was not statistically significant. I did this to allow for a wider range of studies, and results, to be evaluated.

Based upon the findings of this critical review, the effectiveness of narrative-driven digital educational games is not limited to games targeting a specific subject area, learning outcome, or target age group; to games made in a specific genre, for a particular mode of delivery or context for play; or to games involving a particular number of players. Nor does success seem to rely upon games being designed specifically for education or – on the other hand – specifically for entertainment. These assertions are in keeping with those of Vogel, Cannon-Bowers, Bowers, and Wright (2006), who suggested that interactive games and/or simulations can lead not only to higher levels of knowledge acquisition, but to better attitudes towards learning, regardless of the gender or age of the player or whether players played the games on their own or with others.

The high level of effectiveness of games for motivation, at 88.2% of the 34 games in which it was tested, stands in stark contrast to the findings of Wouters, Van Nimwegen, Van Oostendorp, and Van Der Spek (2013), whose meta-analysis suggested that serious games were more effective for learning and retention, but less motivating, than conventional instructional methods. However, while some games within this review, such as those targeting attitude and behaviour change, might constitute serious games, many others would not, making the findings difficult to compare.

A key difference between this review and many of those that have preceded it is that, while there can be a temptation to suggest that a game is either effective or ineffective, almost one third of studies achieved mixed results. It is only by examining these results in detail that a more complete picture can be gained of what works, and what does not, in developing narrative-driven, digital educational games. These results demonstrate that, even
when the researchers did not find the expected level of improvement in one area, such as Knowledge Acquisition, these were contradicted by other positive findings, particularly in the areas of Skill Acquisition, Engagement, and Motivation. In the case of location-based games, for example, while they were deemed to have been entirely effective just 46.7% of the time, closer examination reveals these games were highly engaging and motivating for players. In the studies in which they were tested, engagement and motivation achieved effectiveness ratings of 100% (6 of 6 studies) and 88.9% (8 of 9 studies) respectively.

Many of the most effective games referred to within the studies that form this critical review share some key features that can be informative for those who seek to design such games or to select suitable games for their own students to play. Firstly, players within these games are invited to embody an authentic role, which assists them to view themselves, and each other, as more than just students (Chee, 2010; Chee & Tan, 2012; Nash & Shaffer, 2011; Romero-Hall, Watson, Adcock, Bliss, & Adams Tufts, 2016). In an extension of this phenomenon, the role of player as tutor has also been explored with success, as participants are required to offer their content-related expertise to assist (Marsh et al., 2011) or even nurture their in-game companions (Liao et al., 2011). Secondly, many effective games allow for, and encourage, communication between players, either during play, as with multiplayer or team games, or in class-based reflection sessions afterwards; this interaction with other participants provides players with a way of consolidating subject knowledge, and fostering skills such as problem-solving and critical thinking (Connolly, Stansfield, & Hainey, 2011; Shih, Shih, Shih, Su, & Chuang, 2010; Squire & Jan, 2007).

These findings are consistent with those of Papastergiou (2009), whose critical review of the empirical evidence on the use of games in health and physical education revealed that such games have the potential to foster collaboration and teamwork both in the local and global contexts. In a study of one such game, Alien Contact! (Dunleavy, Dede, & Mitchell, 2009), researchers designed a jigsaw pedagogy in which players worked in teams of four to investigate the reasons behind an alien landing. As they scoured a location with handheld devices at the ready, each player took on a different role (Chemist, Cryptologist, Computer Hacker, or FBI Agent), and received different pieces of the puzzle, which would only make sense when shared with their teammates. Not only was this engaging for students, but it led to a deeper appreciation of their teammates, as observed by their teacher:

They all took on an identity. They all felt strong ownership that they were an expert at this…and if they didn’t have roles they may not have been as eager to work together because they really did need each person. (Dunleavy et al., 2009, p. 15)
In terms of the narrative elements that might be utilised to create effective games, the findings from this review are quite illuminating. Rieber (1996) called for educational games to employ endogenous rather than exogenous fantasy elements. This is supported by studies included in this critical review, which suggest that the drama must be intertwined with, and dependent upon, the learning tasks (Ke, 2008; ter Vrugte et al., 2015). When narrative, game mechanics and learning are completely balanced, the player may not even be aware that they are playing a game designed for learning (Marsh et al., 2011). As the creators and researchers of one such game, Quest Atlantis, have pointed out, “Possibly due to the immersive simulation context (perceptual immersion) or to the compelling nature of the story (narrative immersion), literally all students appeared to be engaged, with actual shouts of glee occurring when the teacher announced that it was time to work …” (Barab, Sadler, Heiselt, Hickey, & Zuiker, 2007, p. 68).

It seems clear that games would be more likely to keep the player interested by placing the learning in a context which is meaningful and engaging (Barab, Pettyjohn, Gresalfi, Volk, & Solomou, 2012; Rubino, Barberis, Xhembulla, & Malnati, 2015). This has been achieved in several cases by adhering to the traditional Hero’s Journey (Lopez-Arcos, Padilla-Zea, Paderewski, Gutierrez, & Abad-Arranz, 2014), a technique originally suggested by Dickey (2006a), while others have stressed the importance of making the dramatic stakes of the player’s actions clear. Barab et al. (2012) suggest that these stakes have the potential not only to engage the player’s interest, but to subvert some of the traditional expectations of what constitutes authentic learning within the contemporary classroom. After introducing secondary school students to a game-based intervention with a focus on the ethics of medical research, they concluded that “… It might be argued that the fictional consequentiality afforded by the game play was more real in terms of legitimizing the content and the student than was the real world potential of doing better on a future test” (p. 531). Similarly, Tüzün, Yılmaz-Soylu, Karakuş, İnai, and Kızılkaya (2009) noted that fourth and fifth graders playing such a game, which was designed to teach them about Geography, demonstrated not only higher levels of knowledge acquisition, statistically significant increases in intrinsic motivation and decreases in extrinsic motivation after play, which translated into less focus on grades as the sole marker of success.

This review reinforces the importance, for players, of having an emotional connection with the game, allowing them to develop a sense of empathy, which is the key to fostering critical reflection (Gee, 2011) as well as a range of other learning outcomes, including knowledge and skill acquisition, engagement, enjoyment, motivation, immersion and
identification, all of which have been shown to increase when the player has someone to care about, whether that someone is the point-of-view character (Chee, Tan, & Liu, 2010; Lopez-Arcos et al., 2014; Nash & Shaffer, 2011); another player’s avatar in a multiplayer game (Chee & Tan, 2012; Zheng, Young, Wagner, & Brewer, 2009); another person whom the player can talk to, in the real world, face-to-face during gameplay (Facer et al., 2004; Gordon & Schirra, 2011); or a suitably sympathetic NPC (Christopoulos, Mavridis, Andreadis, & Karigiannis, 2011; Romero-Hall et al., 2016; Tice et al., 2009). If this can be achieved, it seems probable that such a game is well on its way to fulfilling Clark Abt’s ideal for serious games: “… problem situations with dramatic scenarios that best reveal solutions” (Abt, 1970, p. xiv).

Finally, although this review was fundamentally aimed at investigating the effectiveness of narrative-driven digital educational games, the data revealed other fascinating trends in the realm of narrative-driven digital educational game research. Of the 130 studies covered in this review, 64 were undertaken by teams that included game designers, while only two acknowledged the inclusion of a dedicated writer. While interest in researching this area continues to grow, there remains a lack of credited writers used within educational game development teams. While it is feasible to assume that some writers’ contributions went unacknowledged, this has implications for the recruitment and retention of high-quality professional writers for such games.

10.3 To what extent do five best practice narrative-driven digital educational games function as action and as text?

The following discussion is based upon the findings of the second interconnected study within this thesis. Rather than structuring it according to the 7 major headings provided by Beavis and Apperley (2012), it has been structured according to the topics that emerged during game and interviewee analysis in order that the games’ most distinctive features may be further interrogated. Many of these features utilise a game’s action and textual affordances to achieve a specific effect. What follows, then, is a wide-ranging discussion of the complexities of writing such games, which must work mechanically, narratively, and educationally, and within an often-unforgiving marketplace.

10.3.1 The importance of creating an authentic learning experience

As has been noted previously, many of the most effective games referred to within study 1 required the player to embody an authentic role (Chee, 2010; Chee & Tan, 2012;
All case studies reinforced this approach to game design.

Spongelab, the company behind *History of Biology* (2010), attempted to foster authentic learning through a combination of realistic narrative elements, challenges, and tools used by the player to complete these challenges. As Friedberg pointed out, “... GenBank is a real tool for scientists, so we wanted you to use the real tool, and I don’t think we could have ever made an approximation of that tool” (J. Friedberg, interview, June 10, 2015). This same philosophy sees the player using Google, as well as real books and images, rather than fake, student-friendly versions of the same information.

For the writers of *High School Story* (2012), one of the most effective ways of creating a sense of authenticity is by mirroring the real world within the game world. Because of the speed with which they can write and integrate a new quest into the game, the team has been able to respond in nearly real time when news breaks. In some ways, this ability to act swiftly to incorporate current events into the game makes it feel akin to journalism, as Writer 2 explained:

… Something crazy happens in the media, and a week later we have a poll question out about it (I mean, technically we could do it that day). Something huge happens, like Gamergate, and however many weeks later there’s a thoughtful, organic character-driven quest about it in the game. I think that’s really important - or it was important to me - to know that I could have an immediate influence as a writer. (Writer 2, interview, April 22, 2015)

For the team responsible for *Global Conflicts: Afghanistan* (2014), authenticity was key to creating a believable gaming experience. As Nielsen pointed out, in this game the player can actually get *killed* if they say the wrong thing. This was a decision that he and the other designers did not take lightly, recognising that actually killing off the protagonist is unusual in any game, let alone one that is designed for educational purposes. However, this is key to understanding what is actually at stake when one enters a conflict zone:

We ended up having [a situation] where you get captured by [a member of] the Taliban, and you’re interrogated by him, and if you don’t understand the potential danger of the situation you’re in and just keep provoking him, and keep having this very Western kind of criticising opinion, then he ends up shooting you. (J. Nielsen, interview, May 27, 2015)

Within *Hack ‘n’ Slash* (2014), Dillon utilised four levels of hacking in order to build an authentic learning experience for the player, one that would allow them to see through the veil of the game’s surface and begin to understand how to affect the underlying structure.
Because the game is not just replicating the experience of hacking, but actually giving the player access to the same code that the game development team used when testing the game, it is a strange hybrid: a clearly fictional setting that nevertheless promotes epistemic identification with the role of hacker, programmer, or game designer.

The *Virtual Dementia Experience™* (2013) was constructed by educators who believe in the right of every person with dementia to be treated with respect and understanding; as such, it presents the human face of this condition, with the game asking the player not to take on the role of a carer (which might replicate the role they play in real life), but to accept the far more challenging and scarier role of living (albeit briefly) with dementia. This is achieved by immersing the player within a first-person, photorealistic display that is designed to replicate the typical home which has been rendered unfamiliar through the ravages of dementia. With two scenarios designed to present the negative and positive existence of somebody living with this condition, the game is designed to change the perception and ultimately the behaviour of the player in relation to those who live with dementia by forcing them to experience life through the eyes of somebody afflicted with the condition, with the sense of authenticity enhanced through the player’s growing empathy with the protagonist.

Within these games, it was important that the player went beyond simply learning about the topic at hand, whether this was biology, cybersafety, diplomacy, programming, or dementia, and experienced what life might be like for those who are immersed in this world daily. Authenticity was the key to bridging the divide between a player’s everyday life and their identity within the game world. Narrative, including the game’s story, characters, setting, structure, point of view, and use of time, were the mode by which the player could be drawn in to this new way of perceiving the world. Friedberg articulated this when he said, “You’re going through the scientific process: you’re acquiring information, you’re making conclusions, you’re discarding information ... [and] you’re doing it in the context of unravelling the story” (J. Friedberg, interview, June 10, 2015).

### 10.3.2 Immersion and engagement through player action

Immersion has been cited as a strong factor in engaging players (Christopoulos et al., 2011), which often results in a sense of what Csikszentmihalyi (1997) referred to as ‘flow’, a state that has been linked to positive affect (Brom et al., 2014) and improved learning outcomes (Bressler & Bodzin, 2013; Sabourin & Lester, 2014). All five games were designed to engage and immerse the player through their mechanics. In both *High School Story* (2012) and *Global Conflicts: Afghanistan* (2014), the player was asked to choose from a range of
dialogue options, each one of which was designed to lessen the distance between them and the character they were playing as they chose the tone and/or content of the discourse. This same sense of proximity between player and protagonist was gained in the *Virtual Dementia Experience™* (2013) through immersive technology: first, a large-scale audio-visual experience was created on site; later, this experience was replicated in the much more mobile, and personalised, Virtual Reality headset.

10.3.3 Player control over the game world

These games differed in the amount of interactivity, or control, they allowed the player to take within the game world. *Hack ‘n’ Slash* (2014) was at one end of the spectrum, in that it allowed the player to go so far as to break the world if they so desired, while the *Virtual Dementia Experience™* (2013) put the character on rails and only allowed them to interact with the game world in limited ways. *History of Biology* (2010) and *Global Conflicts: Afghanistan* (2014) did not allow the player to influence the naming or look of the central character in any meaningful way, but offered the player quite a broad set of tools with which to solve in-game challenges. Personalising avatars within *High School Story* (2012) was more than window dressing, with the writers pointing out that this engendered their players with a greater sense of ownership of the game world, as well as higher levels of identification with the character’s adventures. These assertions are supported by game theorists (Apperley & Walsh, 2012; Evans, 2004; Gee, 2009), and by the findings from Study 1, which demonstrated the positive learning effects (including behaviour change) of a player feeling connected to their avatar (Facer et al., 2004; Pirovano, Mainetti, Baud-Bovy, Lanzi, & Borghese, 2016). In all cases, the amount and quality of the interaction between player and game world, and their influence over its events, characters and settings, reflected the conceptual aims of the game. As one of the designers of the *Virtual Dementia Experience™* (2013) explained:

> You can never pick the bathroom first. So even if you’ve been through the experience before, and you go, ‘Well, I know the bathroom’s on the left’ and you go for the door on the left, in fact now it’s just going to be a storage cupboard. That frustration, when you think you know where something is, all that frustration of not knowing where something is and being given such a short period of time to find it, we wanted people to experience that and understand that frustration for people living with dementia. (P. Lindsay, interview, September 4, 2015)
10.3.4 Multiliteracies required of players before, during, and after gameplay

Within these 5 games, the literacy skills required of game players were diverse, and include the ability to decode the written word, visual and audio signs and symbols, and interactive game elements (Apperley & Walsh, 2012; Beavis, 2014; Beavis et al., 2012; Evans, 2004; Gee, 2003; Steinkuehler, 2010; Walsh & Apperley, 2009). These games relied heavily upon the written word to convey information and to allow the player to understand what was required of them (usually via onscreen instructions). In some cases, writing was also used, by the player, to convey their own understanding, and desires, to the characters on screen, through the selection of the correct word/sentence, or by typing responses of their own. One consideration, for game teams, was the amount of assistance they offered the player, without breaking the sense of immersion, or undermining the unique decisions and actions that constitute what Gee (2004) refers to as the player’s game trajectory, that is the unique pathway that they might take to progress through the game. All games, except the Virtual Dementia Experience™ (2013) which was designed to be played on site, presented help for the player in the form of on-screen hints and/or interaction with a friendly Non-Player Character.

10.3.5 The importance of reflection, and after-play interaction with peers, in consolidating learning

In all games, written and verbal reflection was viewed by the writers as a key aspect of realising the game’s learning potential, a suggestion endorsed by several studies synthesised within Study 1, which demonstrated that – combined with other factors – it could lead to deeper thinking (Squire & Jan, 2007) and the successful application of skills and knowledge outside the game (Bliemel & Ali-Hassan, 2014).

No matter how much time had been put into developing an educationally efficacious product in the first place, the writers viewed the game itself as only part of the education solution, with reflective activities completed before, during, and after gameplay, with peers and a teacher, seen as the best way to add value to the gameplay experience. For example, in History of Biology (2010), the player moves from what Barthes (1974) would refer to as a ‘readerly’ role in the beginning of the game, when they are completely at the affect of Dr Shyre’s demands; to a more ‘writerly’ role as they must choose whether to ultimately fulfill Shyre’s wishes or accede to the wishes of those with commercial interest in his research.

Presumably, if played within a classroom setting, one player might choose one ending, while another chooses differently, with both players then being able to discuss these
alternate endings and weigh up the possible consequences of their decision. In this way, it would be possible for a student who might be more altruistically-inclined to experiment with acting in a more commercially-focused manner, and vice versa. A teacher could then act as guide, discussing the pros and cons of both approaches.

Similarly, it was the combination of the game and the surrounding training program which the creators of the Virtual Dementia Experience™ (2013) credited with changing the behaviour of participants, which is something that is relatively difficult to do through games alone.

10.3.6 Intertextual referencing within games and game development teams

Interestingly, the development teams for both High School Story (2012) and Global Conflicts: Afghanistan (2014) referred, in-house, to their major learning tasks as ‘boss fights’, reflecting the continuing influence that traditional gaming genres, such as the arcade action genre, have on the way that developers conceptualise their own games. This detail seems to support the notion proposed by many game theorists (Barab et al., 2012; Dickey, 2005, 2006a; Sheldon, 2014) that, whether they are trained as writers or not, those who seek to design educational games should be familiar with the traditions of mainstream games, in order that they might draw from them where appropriate and better meet the expectations of students.

10.3.7 Fostering collaboration through game play

It has been well-established within the gaming literature that developing a sense of community around a game, through communication and collaboration, can enhance the player’s experience by establishing norms, negotiating roles, solving problems, and cooperating to achieve desired outcomes (Shaffer et al., 2005). The value of collaborative problem-solving, in particular, has been reinforced by many of the articles included in Study 1, which have shown this skill as contributing to improvements not only in knowledge acquisition but in engagement (Dunleavy et al., 2009), motivation (Shih et al., 2010) and metacognition (Kim, Park, & Baek, 2009).

All five games covered in Study 2 anticipated that players would communicate, or even collaborate, with other people at some point, whether they were local, such as a classroom full of students and teachers working together to discuss and/or solve in-game problems in Global Conflicts: Afghanistan (2014); or online communities, used by all the other games, to share successes, failures, and strategies. All games profiled handled the
notion of students working with others in different ways. Shaffer et al. (2005) have pointed out that “Games bring together ways of knowing, ways of doing, ways of being, and ways of caring ...” (p. 7). This focus on collaboration means that players must establish norms, negotiate roles, solve problems, and cooperate to achieve desired outcomes, mirroring the behaviours of a successful Learning Community.

10.3.8 The use of paratexts

For Consalvo (2007) paratexts refer to artefacts which spring up like mushrooms around a game, and may be created by the game’s designers, the players, or both. When they are used, they require skills of research and analysis when read, and research and distillation when written by the player (Apperley & Walsh, 2012; Gee, 2009; Walsh & Apperley, 2009). Paratexts were used by all these games in one way or another. In some cases, they took the form of manuals or assignment sheets that were created by the design team for the player to use before, during, or after play. In others, they took the form of walkthroughs and mods that could be shared with, or even created by, the player. When interviewed, the design teams responsible for these games confirmed that, based upon their observations, paratexts assisted in establishing a sense of community around the game as players exchanged in-game currency including game-related knowledge and skills (Consalvo, 2007).

10.3.9 The importance of a game’s status, educational and otherwise, in framing the game play experience

When considering the status of such games, it is important to note that, while there were clear attempts by all three of the educational games to establish their credentials as successful teaching resources, and - in the case of Global Conflicts: Afghanistan (2014) - to inform the visitor of the valuable role that games can play in education, Hack ‘n’ Slash (2014) made no educational pretensions whatsoever. While this may risk it being passed over by teachers in their search for more ‘valuable’ fare, in a school setting in which students may be suspicious or even hostile towards ‘educational games’, such a game may be able to cut through in a way that a more obviously educational title might not. However, as Beavis (2014) has pointed out, “… It is important, too, to recognize the privileged place popular culture may have in students’ lives and to avoid attempting to take it over, turning it into school” (p. 435).
10.3.10 The importance of developing empathy in players

The importance of empathy was a recurring theme within the interviews with the designers of these games, and was cited as a mechanism for creating engagement and understanding in the player, a suggestion that is in keeping with the work of Stuart Brown M.D., founder of the United States’ National Institute for Play (Brown, 2009) and supported by the results of Study 1 (Christopoulos et al., 2011; Gordon & Schirra, 2011; Tice et al., 2009). In *The History of Biology* (2010), the player was required to empathise with Dr Shyre, and with the scientists he most admired, to understand his hesitancy to release the results of his latest experiments. In *High School Story* (2012), it was empathy that allowed the player to move past the positionality which is so often associated with teen fiction, and arrive at a place of true understanding of other students.

In *Global Conflicts: Afghanistan* (2014), the player required empathy to interact with the NPCs he/she met along the way and to understand the ramifications of his/her final argument for or against reopening the school. In *Hack ‘n’ Slash* (2014), it was empathy that allowed the player to recognise the supposedly evil wizard as a character, much like the game’s protagonist, who had allowed his mastery over the world’s technology to develop to a dangerous extent. In the *Virtual Dementia Experience™* (2013), empathy is almost unavoidable as the player grappled with the uncomfortable and disconcerting symptoms of somebody living with dementia. In all these games, the commitment on the part of the game designers to fostering a sense of empathy in the player has forced them to create characters (including that of the protagonist) who are multifaceted, making the games more entertaining and more educational.

10.3.11 The value of frustration in fostering engagement and empathy

It is relatively unusual, within a game, for a player to find it impossible to achieve the in-game goals, yet that is what happens in three of the five games profiled for this study. In these games, the player may be unable to successfully complete the game due to its construction. In *Hack ‘n’ Slash* (2014), this technique has been deliberately chosen to force the player to rethink their strategy, while both *Global Conflicts: Afghanistan* (2014) and the *Virtual Dementia Experience™* (2013) utilise a player’s frustration to foster a greater sense of empathy for the protagonist. For Nielsen, the writer of *Global Conflicts: Afghanistan* (2014), the fact that the protagonist might die at the hands of the Taliban is one of the features that makes the game an educationally rich experience, because it pushes the student beyond their
comfort zone, shakes them up, and gives them an insight into the sorts of life and death decisions that people who live within a conflict zone might have to consider:

It’s very easy to have an opinion about something that happens, you know, five thousand kilometres away, but what if you’re actually stuck in the situation and now it’s actually your neck, you know, your life is on the line, would you actually choose the same things? (J. Nielsen, interview, May 27, 2015)

10.3.12 Game makers’ ideology and its effect on game content

From an ideological standpoint, all games chosen as case studies share the underlying value, or belief, that a game has the power to influence the way that a player thinks and acts outside the classroom. This might mean questioning the next news report that one sees about a supposedly harmless scientific breakthrough; being more tolerant of a student who might at first appear mean or snobby; questioning the validity of a news report which claims a clear victory for one side or another within a conflict zone; being prepared to investigate how a computer program, or game, is constructed; or changing one’s response to news and/or policy decisions relating to the treatment of persons with dementia.

The potential cumulative effects of these changes could be profound. In the case of History of Biology (2010) and Global Conflicts: Afghanistan (2014), such a change reflects the acquisition of a skill: critical thinking. In the case of case of High School Story (2012) and Hack ‘n’ Slash (2014), changes relate to a heightened awareness of one’s own capacities and abilities (self-efficacy), which has been shown to have a positive influence upon students’ intrinsic motivation (Meluso, Zheng, Spires, & Lester, 2012). In the case of the Virtual Dementia Experience™ (2013), a change in attitude has the potential to impact upon the way that player treats the health and wellbeing of others; this is quite a feat considering that Behaviour Change was demonstrated to be the most difficult educational outcome to effect as measured in Study 1. The potential for the Virtual Dementia Experience™ (2013) to engender players with the knowledge, and confidence, to make these changes was at the heart of the game’s design, according to Kelly Burns:

Whenever I develop something, what I’m trying to do is look at skills, confidence, attitude. Whenever I develop any of the education, that’s what I’m trying to tap into, so that when you do take that back to practice, it can make that difference, because changing attitude, changing levels of confidence, can change practice. (K. Burns, interview, October 27, 2015)
10.3.13 The use of humour

Humour is, in and of itself, not necessarily a narrative element according to Chatman’s (1980) classification; neither is it a game mechanic. It is possible, then, to overlook the humour contained within a game, particularly since humour is often seen as simply frivolous. It seems an interesting finding, however, that the two games designed primarily for mainstream purposes, but with relevance to education, utilised humour to connect players to the game’s content. Having played the other games in question, I would not describe them as humourless, but humour was certainly less of a factor in their creation, and none of the writers of those games mentioned it as part of their intent. This could be, perhaps, because the nature of the games is more serious: it may be that the ethics of genetic testing, the painful reality of dementia, or the complexities of a global conflict simply do not lend themselves to one-liners. However, I suspect that there is more to this finding than it might seem. After all, hacking does not seem like an inherently funny concept, and yet it has been deliberately rendered as such by Dillon and Eldridge in *Hack ‘n’ Slash* (2014). And, while there are certainly some very serious moments within *High School Story* (2012), its writers were conscious of wanting to provide light as well as shadow. This is a technique that the creators of games created predominantly for educational purposes might consider adopting on a more regular basis. After all, fun was a consideration not only for the writers interviewed in preparation for this study, all of whom referred to it at least in passing, but for influential game theorists as well (Caillous & Barash, 1961; Huizinga, 1949).

10.3.14 The business of writing narrative-driven digital educational games

A game is not played in a vacuum, or in a hermetically sealed gameplay chamber; it is played in the real world, where players are subject to extraneous sound and visuals, including communication with other people, both wanted and unwanted. All educational game writers spoke about the difference between the ambition behind designing a game and the reality of releasing it to the market.

It is evident that, for each of the game writers, it is necessary to cut to their cloth, meaning that they must often weigh the game play experience they are trying to create against budgetary and time constraints. This point is reinforced by one of the Key Informants, Chris Avellone, whose writing is recognised within the mainstream games industry as ground-breaking. While the writer in him is always keen to create an intricately-plotted, emotionally-satisfying experience for the player, he has come to accept that the player can create their own significant moments, so long as the game world is appropriately responsive.
His position, today, is one of providing a sandbox within which the player can play any role they see fit.

For at least one of the educational game writers, the expense of creating a narrative-heavy game, which has limited replay value, is starting to make less sense. Nielsen, who wrote *Global Conflicts: Afghanistan* (2014), suggested that it is important to ensure that players can get the maximum amount of replay value from the hours, and money, put into the game, which can be difficult for those who wish to create narrative-driven games:

In my mind, it seems we are moving slowly away from the very narratively-heavy games, which I guess is for financial reasons. It’s quite time consuming to write that much dialogue, at least compared to the amount of game time you get out of it. So, you know, I spend x number of hours writing 30 minutes of gameplay, whereas if I spend the same amount of time on a strategy game, I might be able to make 3 hours, 4 hours, maybe more. And the strategy game would also have a lot more replayability, whereas a narrative game you usually play it once. I mean, it’s also like commercial games: if I buy a narrative game, I play through it once, but if I play *Civilization*, or whatever, then I can just play it forever. (J. Nielsen, interview, May 27, 2015)

### 10.3.15 Successful game writers come from a range of backgrounds

When I began collecting games for analysis, I assumed that it would be necessary, or at the very least preferable, for each narrative-driven digital educational game design team to contain one or more professional writers. After meeting with the teams responsible for the design of the five high-quality games included in Study 2, I no longer believe that a great game writer will necessarily have trained in professional writing, or be an experienced practitioner in the development of novels, screenplays, and other fictional writing.

I have spoken to professionals such as Friedberg from *History of Biology* (2010), Eldridge from *Hack ‘n’ Slash* (2014), and McGuire from the *Virtual Dementia Experience™* (2013) who, despite a lack of experience in writing for traditional media, have accepted the mantle of ‘game writer’ with the same commitment to quality and spirit of experimentation that Megler accepted her role as writer on *The Hobbit* (1982) more than thirty years ago. While some writers like Nielsen, Dillon, Lindsay, and both writers for *High School Story* (2012), had a clearly developed philosophy about writing and narrative, others – particularly those who had not been trained in writing – were less clear about their philosophy. Rather than having little to say in this regard, however, I found that all writers could articulate why they made the creative choices they had made, even if they were not familiar with the technical narrative language.
10.3.16 Game writers’ responsibilities are many and varied

Each educational game writer who participated in this inquiry was responsible for creating some, if not all, of the game’s narrative elements (Chatman, 1980); they usually began working on the game during the concept design phase, and contributed to a script that outlined what happens in the game (events), when and where it happens (setting), and who it happens to (characters). However, some of the writers not only worked on the concept and script for the game, but on a multitude of other aspects - audio, visual, and mechanical – which are key to realising the game as both action and text. They also contributed to the educational guides and other teaching materials that were designed to accompany the game. Other tasks that one or more writers reported contributing to included: visual design of characters, audio-visual design of settings, direction of voice actors, and player testing.

Features of the game design process which were not explicitly mentioned by the writers during their interviews include: choosing the visual point of view from which game scenes will be viewed by the player, design of menu screens and other non-narrative elements that nevertheless contribute to tone of the game, choice of player 'actions' that might be undertaken to complete quests/puzzles, and selection of prizes given to the player for the successful completion of challenges. It may be the case that these tasks were taken on by other employees, or that the writers did not recall them during their interviews.

10.4 How are narrative elements used, within these games, to promote their learning objectives?

Study 1 has shown that narrative-driven games can be effective learning tools, whether the intention is for the player to gain knowledge or skills, or to change their attitude or behaviour. Although there remains a lack of studies which regard specific narrative elements as dependent variables, it is safe to say that, in combination, these elements (events, characters, setting, structure, point of view, and time), have the power to engage the player, contextualise information, and give meaning to in-game challenges. Moreover, such games have been demonstrated to be effective, in most cases, regardless of gender, age, context of play, or mode of delivery.

The games that were chosen for Study 2 reflect a range of ways in which narrative can be conceived of by those approaching the design of a narrative-driven digital educational game. While History of Biology (2010), Global Conflicts: Afghanistan (2014), High School Story (2012), and Hack ‘n’ Slash (2014) rely upon detailed plots and in-depth characterisation
to convey crucial information, the *Virtual Dementia Experience™* (2013) delivers such information experientially, a minimalist approach to the inclusion of narrative elements which is supported, in large part, because of the detailed discussions before and after playing the game which are mandated within the organisation’s training programme.

The connection between games and more traditional storytelling experiences were evident, including: the use of a hook, a protagonist with a questionable past, delayed exposition, rising tension, a satisfying climax, and a denouement. Due to the interactive nature of the games, however, these narrative devices were filtered through the actions of the player, which may allow them to take on an identity within the game that is very different from their identity in the real world. The way that identity was forged through game play gives further credence to the perception of games not as either a narrative experience (Atkins, 2003; Bolter, 2001; Murray, 1997) or a ludic experience (Aarseth, 2001; Eskelinen, 2001; Frasca, 1999; Juul, 2001), but as a combination of the two. This conception of a game as a unified whole made up of narrative and ludic principles is in keeping with the philosophical claims which underpin the *Games as Action, Games as Text* framework (Apperley & Beavis, 2011; Beavis, 2014; Beavis et al., 2012). It is a conception reinforced by the Key Informants, as articulated by novelist, screenplay writer, and game writer Matt Costello:

> [With a game], I could go down this corridor, I can check back and check if I can get my weapon upgrade, I can see if the transport ships come in from Mars. What do I want to do? And it’s all going to be fuelled by the same thing that fuels a character in the novel, which is the character in the novel wants to achieve a certain goal or do something, the player, theoretically, is also working to achieve a certain goal and do something. So, the difference in a game is you take all the things you normally have to ‘speedboat’ past when you’re writing [a novel], and in a game, you can have many of them. (M. Costello, interview, March 19, 2015)

Much criticism has been levelled at educational games, with critics arguing that many do not teach effectively (Gunter et al., 2008; Tobias et al., 2015), while others lack entertainment value (Hirumi et al., 2010; Plass et al., 2013; Prensky, 2005). Examining these five case studies, however, it is clear that games such as *High School Story* (2012) and *Hack ‘n’ Slash* (2014), whose main purpose is to entertain, have successfully managed to incorporate educational elements that serve to engage their players more broadly and deeply with the product; while the Educational titles, *History of Biology* (2010), *Global Conflicts: Afghanistan* (2014), and the *Virtual Dementia Experience™* (2013) have utilised narrative and mechanical elements in an attempt to engage the player’s interest and enhance their learning.
For McGuire, one of the designers of the *Virtual Dementia Experience™* (2013), the whole notion of what constitutes a game for learning is ripe for reimagining, particularly as the area of serious games, in which he has been working, sees an unprecedented surge in interest. The key to this reimagining, he suggests, is reconsidering the relationship between narrative, game mechanics, and learning in such games. In keeping with the recommendations of those who have used games to affect learning and reported on in Study 1 (Ke, 2008; Marsh et al., 2011; ter Vrugte et al., 2015), McGuire asserts that learning should not be something that the player has to get through in order to get to more rewarding narrative and gameplay elements; instead, it should form the basis of the player’s actions, the things they must do in order to successfully navigate their way through the game’s challenges. He refers to two popular mainstream games which convey game-appropriate knowledge and skills to make his point:

*Portal* is basically the best example of an educational game that I can think of, because, like a lot of good games, it teaches you the paradigms of the game, and it slowly divulges bits and pieces until you can see the whole, and see how those bits you’ve learned fit in. A lot of games work like that, even games like Counterstrike; they’re all about learning the systems and then being able to apply the systems. But I think educational games have a focus on learning the system as its own reward, as opposed to these layers of abstraction that we put on top, like score, in-game currency, ranking, social interaction, these kinds of things. (L. McGuire, interview, September 15, 2015)

McGuire also articulates the notion, expressed by all game writers/designers interviewed for Study 2 and reinforced by many of the researchers whose work was featured in Study 1 (Barab et al., 2012; Rubino et al., 2015), that it is important to create a believable context for the learning, in which the player can see a real purpose for undertaking a given task. He states:

This is why we use practical examples of things: because then you can demonstrate value, and you can show people why they should be learning it. And if you can do that, you’ve got a far higher chance of actually inspiring the individual’s own desire to learn beyond you just telling them to learn because it’s a good thing to do. (L. McGuire, interview, September 15, 2015)

Clearly, these case studies support the notion, proposed by experienced game designer and theorist Lee Sheldon (2014), that it is not necessary to think of games as *either* educational *or* entertaining; instead, the best educational games will be entertaining, and the most entertaining games will naturally educate the player. It is the task of the game design team, including the writer/s, to find the optimal balance between the two. As well as citing
the potentially positive effects of incorporating narrative elements into educational games, both Friedberg and Nielsen were careful to point out that not all games must contain narrative elements to be considered compelling. Nielsen explained:

You need to understand that, at least for educational games, I think, the narrative is not the main driver for doing this. I mean, it’s not because you want to be an author that you write educational narrative games. Your main goal is still to … choose the best game solution for your topic. If you’re told what your topic is, then you need to decide whether a narrative game is actually the best solution for it, because that might [or might not be] be the case ... If you focus on Afghanistan, that’s narrative at its core, but there are a lot of … simulations without any narrative, and there are a lot of steps in between, with degrees of narrative, that might be interesting. (J. Nielsen, interview, May 27, 2015)

These assertions were in keeping with the views of the narrative experts who acted as Key Informants on this study, all of whom advocated approaching the design of a game, including its aesthetic and narrative elements, on a case-by-case basis. Fortugno, who co-created the educational title *Ayiti: The Cost of Life* (2006) amongst other games, comes from what he describes as the school of formalist game design, one of the principles of which is that there are similarities between games on all platforms. As such, when designing game, he often begins by considering the way that the game needs to function (its core mechanic/s), and then attaches the narrative elements to this underlying structure, thereby ensuring that the gameplay will be as compelling as possible.

10.5 Does the analysis of the games’ construction, and interviews with their writers, support the validity of the *Games as Action, Games as Text* framework (Beavis & Apperley, 2012) as a way of understanding game design?

The *Games as Action, Games as Text* (Beavis et al., 2009) framework was originally developed as a curriculum design framework. It was developed by game and education researchers, and was trialled with teachers in the classroom who were taught how they might utilise the sub-categories as points of investigation with students, twisting the concentric circles of Action and Text to explore obvious and less predictable links between these two strata. However, its use as the basis for Study 2 has established that *Games as Action, Games as Text* (Beavis & Apperley, 2012) is equally suitable as a framework for the analysis of both educational and mainstream games. Within this study, it has illuminated many complexities when one is trying to create best practice narrative-driven digital educational games.

I repurposed this framework by ensuring that all terms were defined, referring to the work of the authors where possible and enhancing these definitions where necessary, a
process that I will describe in section 10.5.1. I then used these definitions as the basis for creating 120 guide questions which relate to each of these categories. These questions were designed to allow any game researcher to undertake an analysis of a narrative-driven digital educational game by using the framework. I worked in Excel and analysed each game based upon every sub-category contained within the framework, applying these sub-categories, working horizontally, in one sub-category then the next. After analysing a specific feature in relation to the game, I selected relevant quotes from an interview with the game’s writer/s, which I had previously coded in NVivo using the same themes.

Having completed my analysis of one game and the connected interview (Case Study 1), I further refined the guide questions which were applied to Case Study 1 before moving on to the other case studies. When analysing Case Studies 2-5, I worked vertically, analysing the way that a game element (such as non-players) had been used in all games before moving on to the next sub-category. I did this to provide a consistent interpretation of the meaning of the sub-category. While doing so, I took notes on similarities and differences between the realisation of the element within different games, which I could consult and rework later, in preparation for writing the discussion that now appears within this chapter.

Of course, applying a framework to the analysis of games themselves is hardly new. In the past, such an analysis has been performed with a range of frameworks, many of which were considered, and discarded, for this inquiry. These include the game-ontological approach (Dahlskog et al., 2009; Elverdam & Aarseth, 2007); the G/P/S model (Djaouti et al., 2011); the RETAIN model (Gunter et al., 2008). What distinguishes this inquiry from many before it is the attention paid, within my process of analysis, to the role of the writer in constructing these narrative-driven digital educational games. I have attempted to describe their intentions and process in creating the games in question, and have used their own words to illustrate these claims wherever possible. Having done so, this research has validated the framework as a tool for understanding game design.

The fruits of the analysis allowed by the framework can be seen in the detailed discussion of game features which constitutes much of this chapter. For the most part, it was perfect for understanding the breadth of tasks that must be considered when designing a contemporary game. The framework allowed me to offer a comprehensive analysis no matter what the game’s audience, context of play, or mode of delivery. It also structured an inquiry into elements of the game which are often ignored within other game analysis frameworks (loosely grouped under the heading ‘paratexts’), which are created by the designers and by players before, during, and after play. While the seventh section, Learning through Games,
might at first appear to be only appropriate for educational games, it should be noted that there is a long history of appropriating mainstream games for the classroom (Becker, 2001).
CHAPTER 11: CONCLUSIONS AND RECOMMENDATIONS

I’d say if you wanna go in the educational field and educational games, you should also be a master. It would be good if you were also a master of all different kinds of fictional worlds and forms of storytelling - the elements of storytelling - ’cause I think that’s actually part of what you use. As I said, we’ve got a long way to go there. Tremendous potential, but a long way to go. (M. Costello, interview, March 19, 2015)

This inquiry was constructed to answer the question, ‘How can the writers of narrative-driven digital educational games improve these games’ potential effectiveness using action and textual elements?’ Having conducted the two interlocking studies described herein, I have made many observations about what the empirical literature has shown. By speaking with those who are engaged in writing these games, I have reiterated the complexities that await anybody who attempts to create a game for the purposes of both education and entertainment. Having done so, I would suggest that the effectiveness of such games relies upon these two disparate and sometimes competing elements to be combined in a way that not only feels natural to the player but which allows each element to enhance the other. This realisation was rendered visible through the adoption, and enhancement, of the Games as Action, Games as Text framework (Beavis and Apperley, 2012).

Having interviewed key informants, conducted a critical review of the empirical literature, and analysed 5 best-practice games, I have identified significant gaps in what is currently understood about creating narrative-driven digital educational games. In the academic literature, it is a common claim that the effectiveness of such games has not been demonstrated. Most studies included within my critical review would suggest that such games can indeed be effective in achieving most, if not all, of their educational aims to at least the same extent as traditional classroom deliver, or business as usual. Further, these results indicate that high-quality writing improves student outcomes by fostering deeper engagement and creating meaning beyond grades. This finding is significant because games are expensive and time consuming to create, and it is important for those who must invest money and time to have confidence that what they produce will be more effective than what is currently in use.

The second way in which my findings fill a gap in knowledge is by identifying the many complex, and often competing, skills required of the prospective narrative-driven digital educational game writer. From a narrative standpoint, it is the writer’s task to ensure that events are logical and meaningful; characters are suitably complex, surprising, and relatable; settings add to the sense of tangibility and tone; structure is manipulated to create
interest and keep the player guessing; point of view is clear and engaging, offering the player insight into the experience of one or more essential characters; and time is harnessed to heighten the sense of drama. From an educational standpoint, the writer of such a game must also be able to create authentic learning opportunities; foster multiliteracies; generate paratexts and allowing users to generate their own; contribute to educational materials that might be used before, during, and after play; support intra-audience communication including sharing and collaboration via social media; integrate the design team’s ideology with what is required of the player; and parse written or verbal instructions to make sure that they are not overly didactic. It would seem clear, then, that this is the domain of a specialist.

Many labels might currently be attributed to a team member who is responsible for these aspects of the game. I would like to see the title Writer used more consistently. By accurately labelling and recognising these specialists, the educational games industry can elevate the status of educational game writing. Indeed, it would be positive to see awards given for the writing of such games in the same way that awards for writing are given to mainstream games. Raising the status of these writers will not only increase the health of the educational games industry, but may allow it to compete with the mainstream games industry and traditional media in recruiting writers of the highest quality.

While some of the findings at the heart of this inquiry might appear relatively common-sense to experienced writers, it should be noted that most of those who will encounter narrative-driven digital educational games, from idea to playable product, are not experienced writers. On the development side are the production companies, many of which are run by businesspersons and academics who can see the potential learning gains that experiential learning can foster in players. Then there are the content experts, who are often paired with programmers to realise the producers’ educational aims, a process that can result in the production of didactic and – yes – boring games which, if they incorporate narrative at all, do it exogenously, wherein the narrative adds little more than a sugary coating over the often-bitter pill of the requisite content knowledge.

By contrast, there are narrative-driven digital educational games, such as the five described within Study 2, that are developed by producers who respect the artistry required to juggle these sometimes diametrically opposed aims. These games are written by professionals who understand – either through previous writing experience or because of their understanding of the aesthetic and educational needs of their target market – that, just because the player may be forced to play the game in Science class or as part of a Professional Development session, does not guarantee that they will be engaged in the
experience. These writers use the traditional elements of Narrative – careful plotting of events, sympathetic characters, beguiling settings, humorous dialogue, and well-considered dramatic stakes. By doing so, they can engage the player at a narrative level, and open the door for the learning to begin. Given the ability of the writers interviewed for this thesis to articulate the narrative and educational aims of the game, and the varied means by which these may achieved, it seems reasonable to suggest that the writer should be invited to contribute to as many aspects of the game design process as possible, to ensure that the game feels, to the player, like a unified whole.

It can be tempting to assume that, as the highest-grossing category of media product, the steady improvement of games is assured; and, within the broader games industry, this is probably a safe assumption. After all, an ever-growing number of games combined with a seemingly insatiable hunger on the part of the player for new gaming experiences should continue to push the medium not only technologically but aesthetically. This means that players can look forward to narratives being told, in future, in ways that they cannot presently imagine. Within education, however, there is no guarantee that such innovation will flourish. With a smaller piece of the game development pie, and conservatism on the part of many teachers and parents, who function as gatekeepers, there is downward pressure on the amount of innovation – narrative and otherwise – that game producers can allow themselves.

One case, cited within Study 2, helps to illustrate the relative value of embracing a leaner, more industry-focused model for educational game development, one which leverages off the resources that are at the disposal of studios that create games predominantly for entertainment. While Hack ‘n’ Slash (2014) was made with a relatively small budget and small team, its writer/creator was given a large amount of creative leeway. The result is an adventure game that pushes the boundaries of what we understand as ‘education’ by raising important ethical questions while fostering a player’s understanding of how computer code can be used and abused. As such, Hack ‘n’ Slash (2014) represents one possible way for the educational game industry to grow. If educational games of the future were not required to place the learning so obviously up front, they could focus on engaging and motivating the player through narrative elements while assisting the player to build their subject knowledge and skills in the background. Such games would not rely upon the rote memorisation of facts and figures, but would focus on epistemic learning, in which the player does not just use the vocabulary of their assigned role but must come to think like them.

When assigning such games for play at school, teachers may have to take the initiative and try a range of games – whether they are labelled ‘educational’ or ‘mainstream’
– to find those that will be most engaging for their students. When they have found a game that they believe their students will play, they may have to embellish it by creating paratexts, or encouraging students to do so, to extract the maximum amount of learning from it. If a culture of game use and embellishment could be fostered amongst teachers, such resources could be shared between them, creating an ecosystem of teacher- and student-generated paratexts.

Ultimately, the approach taken to developing narrative-driven digital educational games, and to choosing games for the classroom, must be made with the end user in mind: the student. Today’s student is surrounded by an everchanging media landscape; games form one pillar of this landscape. This is a crowded marketplace, one in which many of the didactic games of past and present would simply not survive if they were not artificially propped up by recommendations from gatekeepers who insist that that the underlying educational subject matter is worthy of attention. This argument will only work for so long.

As education moves towards a greater level of personalisation, it is highly likely – even preferable - that students will demand a higher quality game, one that not only meets their learning needs but appeals to them on an aesthetic level. The adage that students will not play a game if they know that it is educational is disproven by *High School Story* (2012), where the inclusion of educational quests has led to an increase in engagement. But these quests are the exception that prove the rule. They are not merely didactic lessons that the player must learn; instead, they are integral to understanding the world that the protagonist and secondary characters inhabit … a world that the player has come to care about.

The role of the writer in creating narrative-driven digital educational games, then, is one that bridges the past and the future of storytelling and learning. The narrative features used in games are the same as those used by storytellers around the campfire, in the novel, and on stage and screen. But the rise of interactivity, combined with the increasing demands of audiences who have come to expect exponential technological advance, necessitates an unprecedented level of flexibility on the part of the writer. Until the challenges associated with writing games that must educate and entertain are better understood by those who produce and purchase such games, these writers will need to be able to justify and even defend their creative approach. I hope that this task will be made somewhat easier by the insights generated within this dissertation.
11.1 **Strengths and Limitations**

I began my dissertation in late 2013, when I was halfway through developing two narrative-driven digital educational games that I hoped would provide the basis for a discussion of how a writer experienced in writing fiction and non-fiction had approached the task of working in a relatively young medium and in an area in which, traditionally, narrative is given far less attention and respect than other game elements, particularly education. In the years that have followed, my knowledge about the way that such games function has increased in proportion to my growing network of talented game creators, writers, artists, and programmers from around the world. Nowhere is this more evident than in the high-quality interviewees who made up my Key Informants, without whose input my study would never have been as robust. This combination of personal insight and industry focus has given me a unique insight into the game writing process in relation to both mainstream and educational games. While this approach has yielded some fascinating and unexpected results, there are areas in which the limitations of my research are clear.

In my critical review, every attempt was made to be comprehensive in the location and synthesis of relevant research, but the review is not exhaustive; it summarises the research on narrative-driven digital educational games based upon the search terms used, the databases included, and the period of the review. Each study chosen for inclusion has been reported on using its own terms for assessing effectiveness. While I believe that this has maintained the integrity of the studies’ original findings, it is important to acknowledge that results can only be descriptive, since no meta-analysis of the includes studies’ findings is possible. During each screening phase, I attempted to include all relevant interventions; however, if the study’s authors did not provide enough detail about the game to decide whether it met the inclusion criteria, I removed the article rather than allowing its results to erroneously influence the findings. To attempt to include as many suitable interventions as possible, before dismissing a potentially relevant intervention, I visited publicly-accessible web pages to assess whether the game was, indeed, both educational and narrative-driven. This approach has ensured that every study that made it into the synthesis reported on an intervention in which the effectiveness of a narrative-driven educational game was assessed. Previous studies have noted that educational game- and simulation-related literature suffers from some publication bias (Sitzmann, 2011). If not for this bias, a higher proportion of less effective studies may have been included in a review, and the results may therefore have looked different.
In Study 2, I have attempted to offer a comprehensive analysis of the five games I have chosen, but these games by no means represent the full gamut of narrative-driven digital educational game types. I had hoped, for example, to speak with a writer from an indigenous background who won a major award for creating a game that accurately represented his people’s culture for 21st Century learners. However, despite gaining the agreement of the game’s publishers to profile the game, I was unable to gain the consent of the writer. Despite my disappointment at the omission of this outstanding game from the line-up contained within this dissertation, I acknowledge that it is impossible to cover every permutation of the narrative-driven digital educational game. This is why this thesis never offers a How To guide, or a Top 10 list of things to consider when writing such games: the medium of game development is still relatively young, and such is the speed and quality of innovation within the industry that these lists are doomed to obsolescence almost as quickly as they are written.

Another limitation of Study 2 is that the analysis of how these games work relies upon two perspectives, that of the researcher and of the writers of these games, with a third valid perspective – that of the student-player – remaining silent. This question is gaining increased importance as games move away from putting the player ‘on rails’ and embrace a more open-world approach in which the player has a greater level of choice with regard to the direction the narrative might take, with the way their own character might look, and with the way the game world looks and functions. As such, I have addressed this as a recommendation for further research.

11.2 Recommendations

During the three years since I began this research journey, the general acceptance of educational games has grown within the broader games industry, educational publishing, and the educational institutions that will ultimately use these games. While I remain committed to improving, and promoting, the use of narrative-driven digital educational games, the conceptual and creative journey I have undertaken has opened my eyes to the possibility that digital games have the potential to become yet another over-hyped solution to fixing education. Therefore, lest I be accused of ending up on my own quest for ‘Grails and Gadgets’, I should say that I do not believe that games will fix education. I would reiterate the claim made by Simon Egenfeldt-Nielsen (2007), a highly-respected games theorist and creator of the Global Conflicts series, that, while games can be suitable for some tasks, they are not a magic wand. Based upon the results obtained in Studies 1 and 2, and my own critical and creative journey, I would make four recommendations for further work to be
undertaken in this area. The first three are aimed at game researchers, while the fourth is aimed at educational game writers.

11.2.1 Investigating the educational effectiveness of individual narrative elements on educational outcomes

As shown in Study 1, narrative-driven, digital educational games are at least partially effective in most cases, with more than 95% of studies reporting that the game/s they tested met at least some of their intended educational outcomes. A key difference between this review and many of those that have preceded it is that I have broken these results down further, to show that even when the researchers did not find the expected level of improvement in one area, improvement was often shown in other learning outcomes. However, the current state of research does not allow researchers to see how individual narrative elements may affect learning outcomes. To understand the impact of a particular narrative element will require researchers to utilise a game in which individual narrative elements can be tweaked to allow for comparative testing.

11.2.2 Exploring the educational value of ‘cheating’ in games

To many, cheating, or breaking the rules, may seem to fly in the face of good studentship, particularly when they are often actively monitored and punished within the wider schooling system. As Consalvo (2007) has pointed out, cheating is a part of game play; indeed, it is often cheating that announces that a game has ‘arrived’ within popular culture and has been accepted by the gaming community, with the most avid players sharing ways to game the system on social media. Within the communities of practice that surround such games, these strategies may become forms of capital, or gaming currency, and form part of the game’s culture. For those who seek to design games for educational purposes, which must be approved by a teacher but used by students, how might cheating – or rule-breaking – be encouraged, without undermining the broader ethical lessons being taught? If those who design educational games can accept that cheating has value in this mode of learning, how might such games support this propensity on the part of the player, and build it into the learning itself? Hack ‘n’ Slash (2014) may offer a tangible example of a game that successfully navigates these murky waters, by allowing – and even encouraging – rule-breaking as part of the strategy for completing the game, and promoting the sharing of paratexts, such as tutorials, that reveal these strategies. As such, it may represent a new way of envisaging the educational game. Games as Action, Games as Text (Beavis & Apperley,
2012) offers the researcher a framework within which players’ actions, and the paratexts they may create, can be appraised and understood. This sort of analysis raises the question: if such behaviour is to be expected and even celebrated, can it be called cheating?

11.2.3 Understanding players’ perceptions of themselves as ‘readers’ and ‘writers’

While play-testing the games with students was beyond the scope of this inquiry, it is an area that, as Aarseth (2003) notes, should be attended to in order to complete the “hermeneutic circle of game analysis” (p. 6). In particular, given the topic of this thesis, it would be helpful to understand the degree to which players consider themselves ‘writers’ of such games, including how the various aspects of choice afforded to the player, such as influence over the events of the story or design of an avatar, might affect this perception. As Aarseth (2003) contends, “Since most aspects of play are non-verbal, observing player styles and techniques directly is invaluable, especially if we already know the game with some degree of intimacy” (p. 6).

11.2.4 Using the Games as Action, Games as Text framework as a basis for educational game analysis

As has been demonstrated in Study 2, Games as Action, Games as Text (Beavis & Apperley, 2012) offers a comprehensive framework for the analysis of games, including those designed for educational purposes. Its applicability to both mainstream and educational games gives it a particular relevance for educational researchers who wish to compare the way that games might be designed to achieve various effects, such as engagement, when they are created for different audiences and purposes.

In order to standardise the use of the framework for game analysis, it is recommended that researchers use the definitions provided in Appendix D and the guide questions provided in Appendix E, which might be altered in keeping with the suggestions for elaboration made in the previous chapter. While the rubric I designed in Excel to assist in analysing these games is only one of many possible approaches that might be adopted, utilising a grid format for the analysis, which incorporates the researcher’s game analysis as well as relevant quotes from interviewees, allows patterns and connections to be found quickly both within and between games. This is essential for strengthening the trustworthiness, and therefore the validity, of findings.
As noted in the previous chapter, one way I elaborated upon the framework was by codifying what was meant by ‘Narrative structures and features’. Based upon the storied lineage of narrative theory, I reasoned, such a sub-category might be interpreted in many ways. I chose to use Seymour Chatman’s (1980) bipartite model of Story and Discourse, an approach that I found suitably comprehensive but sat neatly alongside, rather than overlapping with the other sub-categories prescribed by Games as Action, Games as Text (Beavis & Apperley, 2012). In future, I would encourage other researchers to further refine and elaborate upon categories that pertain to their area of expertise, particularly as our collective understanding of the way that games function as both action and text continues to evolve.

While my own area of expertise is narrative theory and professional writing, for instance, it seems prudent to call for one or more experts in game mechanics to specify the actions that might fit within the sub-category Actions in Games World. Refinements and elaborations which do not undermine the coherence of the framework but which seek to clarify and strengthen its categories should assist those who wish to use the framework as the basis for game analysis.

11.2.5 Using the Games as Action, Games as Text framework as a basis for educational game design

Having written educational game design documents for clients in the past, and met with these clients face to face, I have experienced firsthand the difficulty in conveying the need for a particular character to be included, or a particular piece of content knowledge to be given more or less attention within the game. My justification has often relied upon assurances that I, as an experienced writer, understand the effect that such choices will have upon the player. For less experienced writers, or larger teams, such arguments might not work. In these cases, it is essential that everybody is speaking the same language, narratively and educationally.

Games as Action, Games as Text (Beavis & Apperley, 2012), including the definitions for each aspect and the guide questions that I have created based upon these definitions, is an intuitive and comprehensive framework that can convey these complexities of game design to all team members. These include the multiliteracies required of the player; the potential paratexts that might be created by the designers or by the players themselves; the local and global context for gameplay and how this might affect players’ experience and understanding; and how the designers’ ideology might best be realised through gameplay.
Because it was designed with teachers in mind, it also allows game design choices to be effectively packaged for those who might eventually use the game in their classroom. One example of the way that this framework might be used by design teams is in working out how much didactic information to include within the main storyline, and how much to place within objects that are found within the game’s environment, or even within paratexts that are designed to accompany the game.

In order to test the framework’s effectiveness as a game design tool, I would like to see it used from the beginning of a project to the end, and the resulting game analysed for its educational and entertainment value by teachers and students. Given the difficulties that have been noted by Gordon and Schirra (2011) between translating attitude change within a game to behaviour change outside the magic circle, I would suggest that a game that aims to change a player’s behaviour would provide the most robust test. The results should offer insight into the attention that various aspects of the framework should be given within the design process. In turn, this should streamline the design process for the next generation of narrative-driven digital educational game design teams, including writers. Improvements to the design of such games will, of course, have the largest impact upon the end user - the learner - who can look forward to playing games that push the envelope narratively and educationally.
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Appendices

Appendix A: Semi-structured Interview Questions with Key Informants in March/April 2015.

Introductory preamble: Thank you very much for agreeing to participate in this study, which will form the basis of my PhD for Deakin University Australia, in which I am considering the role of narrative in narrative-driven digital educational games. The following questions are designed to be quite broad, to give you the latitude to explore each in a way that makes most sense to you. If you don’t like a question or consider it irrelevant or unanswerable based upon your experience, we can skip it; or, if you want to make a different point entirely, that can be accommodated within the final question. Throughout, please use specific examples from your own experience where appropriate (if you can do so legally) to support your views. You will be given a transcript of this interview, which you can review for accuracy and completeness. When reviewing the transcript, you can also have statements you have made removed, or altered, if you believe that you have divulged commercially sensitive or confidential information.

1. In your view, what makes a story ‘compelling’?
2. Do you believe that the traditional narrative devices (such as structure, plot, characters, themes, setting, and motif) can be achieved effectively within digital games? Do you have examples of where you have done this in games you have worked on?
3. Which of these aspects, if any, do you believe are particularly challenging to achieve in digital games?
4. Observation based upon my impressions of the writer’s work in this medium, and/or what they have commented on in other interviews previously.
5. Do you believe that some game genres lend themselves more easily to being narrative-driven?
6. What do you think that today’s digital game players expect from a game’s story when they sit down to play? How has this changed since you began your career in the industry?
7. When writing games, how has the available technology (such as the graphics, or mechanics such as multiplayer), influenced your narrative choices?
8. How do you see things changing within the games medium over the next few years, and how could/should storytelling change in response?
9. Based upon your experience, what observations (if any) can you make about the challenges and opportunities for writers of narrative-driven educational games?

10. Do you have anything you would like to add?
Appendix B: Plain Language and Consent Form for Key Informants, March 2015.

Plain Language Statement

To: [Insert Name],

Thank you for accepting my LinkedIn contact request, and for responding to my subsequent invitation to participate in this study, which is entitled ‘The role of narrative in digital educational games’. I understand that your time is very valuable, and appreciate you assisting me with my research. This study is composed of three elements:

- Semi-structured interviews with storytelling experts in the larger games industry (key informants);
- An analysis of 5 narrative-driven educational games; and
- Semi-structured interviews with the writers responsible for creating the stories that underpin these games.

You are part of the first group.

The reason that I wish to interview you is that I want to establish some ‘ground rules’ for writing compelling stories in digital games. I will then use these as the basis for my discussion with writers working within educational games to find out how they view the opportunities and challenges associated with their role. The aim of this research is to use the input from both groups of participants to develop advice for writers starting out in narrative-based educational games, which will assist them to make their stories as compelling as possible. It is my hope that this will have a real impact upon the game-play experience for students, particularly the sense of engagement they feel when playing these games, and that this might ultimately improve their educational experience.

If you agree to take part in this interview, by signing the attached consent form, I will contact you at your convenience via Skype, Google Hangouts, or phone, to ask you around 10 questions. I anticipate that these questions will take your 1 hour to answer.

Because you are a recognised expert in the broader games industry, and have spoken publicly about your work, I believe that it would be most effective if I do not de-identify your data, which means that your name would appear within my PhD and any subsequent publications which stem from the PhD; however, if you would prefer that I de-identify your data, please make it clear that you do not wish to be identified by name within this research on page 5. If you choose this option, your name would be replaced with a pseudonym or numerical identifier throughout my PhD and subsequent publications. Please note that, even if your data is de-identified, using a pseudonym or numerical identifier, it may still be possible for people to identify you because of the public nature of your work.

I will digitally record our interview, and give you a copy of your interview transcript which you can check for accuracy and completeness. I do not anticipate that there are any risks for you in participating in this research, professional or otherwise, however I realise that discussing projects that you have previously worked on may mean that you are unable to answer some questions or that, upon reading the transcript of our conversation, you may want
me to remove something that you consider to be commercially sensitive or confidential. I will also note, within the PhD and any subsequent publications, that the views you are expressing are your own and do not necessarily reflect the views of the organisations you have worked with.

All data collected for this study, including recorded interviews and transcripts, will be stored on a password-protected computer and externally on a password-protected Dropbox site to which only I and my supervisors will have access. I will also entrust a copy of all data collected to Deakin’s University Services for protection and preservation. I will back-up all data on a regular basis to ensure that data is not lost throughout the process. Any hard-copy data will be kept in a secure filing cabinet at Deakin Burwood. If participants ask for their data to be de-identified, they will be given a numerical identifier, and any documentation linking their name with this identifier will be kept in a separate file to recorded interviews and their transcripts.

Participation in this study is completely voluntary, and all participants have the right to withdraw at any time and ask that their data be withdrawn. I am unable to offer you reimbursement for your time spent on this research study aside from the satisfaction of knowing that you have contributed to a growing area of study: that of improving educational games development.

Contact me
[Contact details removed for privacy]

Contact my supervisors
If you need to contact my supervisors for any reason, please use the following contact details:
Dr Joanne O’Mara
Faculty of Arts and Education
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Deakin University
Melbourne Burwood Campus, VIC
Australia 3217
Phone: +61 3 92446783
joanne.omara@deakin.edu.au

Dr Julianne Moss
Faculty of Arts and Education
School of Education
Deakin University
Melbourne Burwood Campus, VIC
Australia 3217
Phone: +61 3 92446597
julianne.moss@deakin.edu.au

Complaints
If you have any complaints about any aspect of the project, the way it is being conducted or any questions about your rights as a research participant, then you may contact:
The Manager, Ethics and Biosafety, Deakin University, 221 Burwood Highway, Burwood Victoria 3125, Telephone: 9251 7129, research-ethics@deakin.edu.au

Please quote project number HAE-15-015.
Consent Form

I have read, and I understand the attached Plain Language Statement.
I freely agree to participate in this project according to the conditions in the Plain Language Statement.
I have been given a copy of the Plain Language Statement and Consent Form to keep.
I DO / DO NOT wish to be identified by name within this research.

Participant’s Name (printed)
................................................................................................

Signature .............................................................................. Date
........................................
Appendix C: *Games as Action, Games as Text Definitions (Compiled by L. Jackson, 2015)*

**Games as Action**

Digital games only work when the player takes ‘action’ (Galloway, 2006). When referring to games, Action refers to the non-visual and non-textual elements of gameplay, and acknowledge the active, changing, situated nature of gameplay, as well as the interconnections between games, players and online contexts, both locally and globally (Beavis et al., 2009).

- **Actions**
  
  Actions define both the characters - in terms of the type and variety of actions that the avatar can perform - and the virtual spaces of the digital games, because actions define how the space(s), and the objects within them will be used by the players (Beavis et al., 2009).

  - **Player against computer**
    
    The basis of a digital game is the feedback loop between a player’s actions and the computer. In some cases, the actions a player engages in pit them against the computer, for example as a competitor or combatant.

  - **Player with computer**
    
    In the feedback cycle between player and computer, there are ways in which the game system is designed to aid the player, offering assistance or guidance that is program-based, rather than visual- or character-based, both of which would fall under the ‘text’ category.

  - **Actions in games world**

    Here, the actions considered include the rudimentary actions (such as jump, shoot, click and drag, etc.) that constitute the mechanics of gameplay.

  - **Multimodal literacy**

    The ways in which the player must demonstrate their understanding.

  - **Spatial immersion**

    The extent to which a player might be ‘immersed’ in a game is based upon the extent to which they ‘lose themselves’ inside the game. It is important to consider how their actions tie into this state of immersion.

- **Design**

  Design embraces several crucial and related meanings, which seek to describe the elements that can be ‘designed’ or re-designed by the player during game play (Beavis et al., 2009).
Changing the game

There are many ways in which the player can act to change the game. From a design standpoint, however, mods and level designs would fit into this category.

Building avatars

Some games allow the player to change the look of their avatar, which may also enhance identification with the ‘character’ on screen.

Choosing actions

This category should act as a brief introduction to the ‘degree of choice’ afforded to the player by the designers, and might relate to any element of the game’s design/re-design before or during gameplay.

Community management

This refers to the game makers’ efforts to manage their community by, for instance, offering them opportunities to connect with the game developers on ‘Help’ boards, to connect with other members of the player community on purpose-built blogs or sharing services (so that they can upload/download paratexts), or offering resources to teachers.

Reflection

Just because digital games require the player to engage in action does not mean that they do so unthinkingly; indeed, players are often engaged in reflecting upon their own play and that of others.

Situations

Situations refer primarily to the virtual and physical context of play, which are both local and global (Beavis et al., 2009).

Players

It is important to consider who is playing the game, how many people are playing, and where they are located.

Non-players

‘Non-players’ may include both ‘real’ and ‘virtual’ players. Real players are people within either in the situated or global environment with whom the player is interacting during gameplay, while NPCs are in-game characters who are pre-programmed to interact with the player in specific ways, usually guiding them towards a goal.

Technologies

All digital games must utilise various technologies. The technologies utilised by the game’s designers have a direct influence upon who plays, when, and how.

Paratexts
When considering paratexts under the umbrella of ‘Action’, this includes the design of whole games or levels by the player.

- **Contexts**
  The context can be both local, as in the case of a game situated on one device or within a specific (possibly augmented) location; or global, as in the case of Massively Multiplayer Online Games. Many games now contain both ‘modes’, with players electing when to play a solo or small group ‘campaign’ and when to enter an online ‘arena’ of some sort, where they can compete and/or cooperate with other players from around the world.

- **Status**
  The status that games enjoy depends upon how they are regarded by others within the local and global socio-cultural environment.

**Games as Text**

Understanding digital games as text means appreciating the extent to which these games could, or should, be conceived of as literate forms entailing (multi)modal elements, multiliteracies and literacy practices (Beavis et al., 2009). This view must be reconciled with the active, changing, situated nature of gameplay, and “account for the interconnections between games, players and online contexts” (Apperley & Beavis, 2011, p. 131).

- **Knowledge about games**
  ‘Knowledge About Games’ views games as cultural artefacts, and focuses upon their narrative and aesthetic elements and how these are used across games and within particular game genres (Beavis et al., 2009).

  - **Narrative structures and features**
    This category utilises Chatman’s (1980) conception of Narrative Elements, namely Events, Character, and Setting, which constitute the *Story*, and Structure, Point of View, and Time, which constitute the *Discourse*.

  - **Generic knowledge**
    ‘Generic’, in this context, refers to the narrowly formulated genre conventions with which a player is often familiar, the understanding of which will assist in both ‘reading’ the game as a text and in playing it in a successful manner, as defined within the ‘action’ layer.

  - **Intertextuality**
    Intertextuality refers to the process of reading texts as linked and always already known.

  - **Ideology**
Games are not created within an ideological vacuum. Depending upon their purpose, intended audience, and the culture within which they are created, they will reveal an ideological basis. In speaking to game creators, this ideology may be articulated outright or may become clear throughout conversation, even if it is not clear, or is in fact refuted, by the speaker.

- Literacies/multiliteracies in games
  This category should refer to what the game player is expected to understand during gameplay.
  - How games structure knowledge and participation
    Consider how knowledge and participation are structured, and focus on when, as well as how, these expectations are conveyed to the player.
  - Developing critical perspectives on games
    While certain participants may reflect upon games in many ways and to differing levels of sophistication, developing a critical perspective on games implies that the player can consider a range of games (or is encouraged to consider a range of games, by the designers) to hone their critical appreciation of games as a whole.

- World around the game
  A game is not played in a vacuum, or in a hermetically sealed gameplay chamber; it is played in the real world, where players are subject to extraneous sound and visuals, including communication with other people, both wanted and unwanted (Beavis et al., 2009).
  - Literacy practices surrounding games
    This category should be reserved for general comments about the literacy practices that players either currently exhibit or are intended to exhibit after playing the game.
  - Paratexts
    Paratexts can include elements designed by the student for use within the game (such as mods) as well as more literary-style criticism of the game itself (such as an essay or presentation), which demonstrate critical understanding of the game's design as a product.
  - Situated contexts for game play
    Games are played in a particular setting. This might be a lounge room or bedroom (as with a console game), on public transport (an app), or on location (an augmented reality or location-based game).
  - Global contexts for play
    The global context for play refers both to a certain type of game, such as a massively multiplayer online game, which has a ‘global’ (or transnational) reach, and the social context
in which a game is played, including societal/cultural expectations and judgments about this
type of game, and the reasons that people choose to play or not to play within certain settings.

- **Gaming capital**
  Gaming capital is a dynamic and highly contextual form of gaming currency which is
  exchanged between players who form part of a culture that surrounds specific games and
  relates to what is important to know about a particular game. The accumulation and exchange
  of such capital are dependent on the specific situation and conditions in which gameplay
  takes place. When a player has a lot of gaming capital, they can improve their reputation
  within the gameplay community.

- **Games and the military entertainment complex**
  The military entertainment complex is relevant to games which seek to connect
  entertainment with military aims, through activities like military simulations, that are either
  explicitly or implicitly supported by the military.

- **Me as games player**
  ‘Me as Games Player’ is founded on the notion that players are ‘positioned’ by the
  game, and must accept or resist this positioning. This raises issues of players’ values,
  ideology, and identity, and their role as player/creator/’reader’. It is closely related to seeing
  games as cultural artefacts, and to understanding the world around the player (Beavis et al.,
  2009).

  - **My involvement as player reader with the game (including engagement and
    reflection)**

    To understand the player’s involvement with the game, it is important to consider
    which play/reading elements are designed to initially hook the player, and keep them invested
    (emotionally and/or psychologically) throughout the game and beyond.

  - **Involvement with other players (in game / out of game)**

    Involvement with other players can take many forms, from competing to cooperating
    in real-time to seeking assistance in the form of walkthroughs or other advice and sharing
    paratexts. The key component is the player experience.

  - **Physically present/absent, personally known/unknown representations of self and
    others**

    This distinguishes between games in which the player/s appear as themselves, and
    games in which they are encouraged, or allowed, to take on other personas.

  - **Identity**
Who the player ‘is’ within the game relates to the identity, or identities, that the player is invited/encouraged/allowed to explore, as well as those he/she is not invited, or discouraged, from exploring. It is important to consider how these relate to his/her identity in the ‘real’ world.

- Learning through games
  Learning through games is a large area of study, which takes in a wide range of underlying issues. Topics include the potential challenges or advantages of designing such games.
    - Learning in curriculum areas
      One type of educational game is based upon a set curriculum. This may be English or Mathematics, or may extend downwards to reading skills for prep students and upwards to learning triage skills for ER doctors and nurses. This topic also covers so-called ‘soft’ topics, such as collaboration, critical and creative thinking.
    - Serious games
      Serious games aim to raise awareness or develop a player’s skills in relation to an educationally-rich or ‘applied’ topic that is industry-focused or has a connection to the real world. They can be found in areas as diverse as education, health, and advocacy.
      - Learning about learning (including metacognition)
        This category concerns educational games (either curriculum-based or serious) that actively foster metacognition.
      - Critiquing games/ critical literacy
        This category refers to when an educational game actively seeks to get students thinking about the way that games and other texts are constructed, either as its primary occupation or as one aspect of many.
Appendix D: Guide Questions for Analysis Using *Games as Action, Games as Text* (L. Jackson, 2015)

<table>
<thead>
<tr>
<th>Topic</th>
<th>Guide Questions</th>
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<tbody>
<tr>
<td>Games as Action</td>
<td>• How do the non-visual and non-textual elements of gameplay reflect the active, changing, situated nature of gameplay?</td>
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<tr>
<td></td>
<td>• To what extent do they illustrate the interconnections between games, players and online contexts, both locally and globally?</td>
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<tr>
<td></td>
<td>• Actions</td>
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<td></td>
<td>• What actions can the player perform?</td>
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<td></td>
<td>• How do player actions define how the space/s and the objects within them are used?</td>
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<tr>
<td>o  Player against computer</td>
<td>• In what way/s (if any) is the player required to play against the computer, including as competitor or combatant?</td>
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<tr>
<td>o  Player with computer</td>
<td>• In what mechanical (non-visual, non-narrative) ways, if any, is the game system designed to aid the player?</td>
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<tr>
<td>o  Actions in games world</td>
<td>• What rudimentary actions (such as jump, shoot, click and drag, etc.) constitute the mechanics of gameplay?</td>
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<tr>
<td>o  Multimodal literacy</td>
<td>• In what ways is the player required to demonstrate their understanding of multimodal literacies? (An example includes being required to read and interpret written, visual, and audio instructions or clues within the same task/level.)</td>
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<tr>
<td>o  Spatial immersion</td>
<td>• In what ways do the game’s mechanics encourage the player to ‘lose themselves’ in the game?</td>
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<tr>
<td>o  Design</td>
<td>• Which elements (if any) can be ‘designed’, or re-designed, by the player during game play, and to what end, i.e. how is this designed to affect the experience for the player?</td>
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<tr>
<td>o  Changing the game</td>
<td>• In what ways is the player able to change the game world, or have an impact upon its design? (Mods and level designs would fit into this category, but building</td>
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</table>
avatars fits into the next category.)

- Building avatars
  - Does the game offer the player a choice of avatars? If so, to what extent can the avatar’s appearance be affected by the player?

- Choosing actions
  - How would you describe the ‘degree of choice’ afforded to the player by the designers?
  - Are they given relatively few, or many, options for how to act within the game world? (Note that, while the effect of choices may be textual, this section can deal simply with what choices the player can make mechanically. For instance, are there multiple ‘paths’ to solving problems?)

- Community management
  - To what extent have the game’s creators taken their audience’s views into account in the design of the game, or in re-designing the game post-release?
  - In what ways can the game’s community of users interact with the designers or with each other, or comment or share resources or for other reasons?

- Reflection
  - To what extent, and in what ways, is critical reflection encouraged, or catered for, during and after play?

- Situations
  - How would you describe the virtual and physical context of play, both locally and globally?

- Players
  - Who is playing the game?
  - Are there one or more players?
  - Where are they located, physically and geographically?

- Non-players
  - Who are the ‘non-players’? Are they NPCs (in-game characters who are pre-programmed to interact with the player in specific ways, usually guiding them towards a goal), or real people either in the situated or global environment, with whom the player is interacting during gameplay?

- Technologies
  - What technologies does the game utilise?
  - How might these influence who plays, when, and how?

- Paratexts
  - Is the player allowed/encouraged to engage in productive
paratextual design such as the design of whole games or levels?

- Is the player allowed/encouraged to use paratexts during digital gameplay?
- If so, what do these moments of reflection allow the player to do? (Examples include creating elements, or research solutions to problems.)

  o Contexts

  - Is the game local, i.e. situated on one device or within a specific (possibly augmented) location, or global, as in the case of Massively Multiplayer Online Games?

  o Status

  - Is there any hint, within the game’s design, about the status that games themselves have within a given environment? (In the case of an educational game, there might be information provided for parents/teachers which informs them that the game is ‘worthy’ of study. In a broader sense, the audience could be informed of positive reviews, endorsements, sponsorships, and/or prizes the game has received).

Games as Text

- To what extent could, or should, digital games be conceived of as texts?
- In what sense might they be understood as literate forms entailing (multi)modal elements, multiliteracies and literacy practices?
- How can this view be reconciled with the active, changing, situated nature of gameplay, and account for the interconnections between games, players and online contexts?

  o Knowledge about games

  - What are the game’s key narrative and aesthetic elements, and how do these relate to other games and gaming genres?

  o Narrative structures and features

  - How does this game utilise Chatman’s narrative elements, story (events, character, setting), and discourse (structure, point of view, and time), to engage the player
and keep them playing from beginning to end?

- **Story**
  - How do the story elements (events, character and setting) work within the game?

- **Events**
  - Events within a narrative typically involve the action, reaction, or interaction by characters or the environment around them. What events constitute the story? (This should form a list, presented in chronological order, and should include events that contribute both to the primary narrative and to any secondary narratives, as well as any events which are only implied within the narrative, for instance through character dialogue (reference to a missing family member) or behaviour (a limp that we presume is the result of a war).
  - Which of the events listed constitute actions, in which a character is active?
  - Which constitute happenings, in which the character is the object of the event?

- **Characters**
  - Who are the primary characters in the game? Who are the secondary characters? How could they be described physically? (Sex, what they wear, facial expression, other attributes)
  - How is each character introduced? What does this suggest about them?
  - What principal actions does each character perform or experience throughout the game? (These can include non-verbal physical acts, speeches, thoughts, feelings, perceptions, and sensations.)
  - Is there are narrator in the game? If so, are they overt (participating in the story), or an intrusive outside party? Who is the ‘narratee’ presumed to be?
  - If there is no narrator, is the story being ‘told’ in another way, such as via text that shows up on screen?
  - (If none of the above regarding narrators and narrating
apply, you can describe the text as nonnarrated.)

- **Setting**
  - When and where is the game set? What sets and props, as well as lighting and sound effects, are used to ‘set the scene’?
  - What, if anything, is the player invited to infer, or imagine, exists beyond the edges of the game’s ‘frame’?
  - How does the setting contribute to the ‘mood’ of the game?
  - How does the game’s visual ‘style’ contribute to the setting? (Is it, for instance, photorealistic, or impressionistic?)

- **Discourse**
  - How do the discourse elements (structure, point of view, and time) work within the game?

- **Structure**
  - Re-order the list of events developed under the heading ‘events’ as a synopsis.
  - Identify which of the events listed within the synopsis are essential to the cause-and-effect chain of the central narrative (kernels), and which are inessential to the central narrative (satellites).
  - Which of these events are playable, and which are non-playable (i.e. cut scenes)?
  - Does the game include branching or non-branching stories?
  - Is there are single ending, or multiple endings?

- **Point of view**
  - What ‘role’ does the player take on in the game?
  - How are they introduced to their responsibilities within the game?
  - What actions is the player character they required to perform or experience within this role?
  - How do the player’s actions and experiences ‘position’ them (thematically, politically, socially), i.e. what ideological stance are they asked to share or question? Is the character the player is playing as the game’s
protagonist, or central character?

- Does the player have a complete understanding of all the events, or only a partial understanding?
- If there is a mixture of playable and non-playable scenes, what effect do these decisions about which aspects can and cannot be ‘played’ have on the player experience?
- Is the player’s character the narrator?
- How much of what the player knows about this central character, any other characters, and the broader ‘world’ of the game, is based upon what they witness, and how much is it based upon pre-existing perceptions, cognitions, attitudes, emotions, memories, and fantasies that are shared with the player (through flashbacks and other means)?

**Time**

- Order:
  - Does the game use techniques such as a flashback (analepsis) or flash forward/foreshadowing (prolepsis)? If the answer is ‘yes’, why does he/she do so? (Does it, for instance, fill in ‘gaps’ in the player’s understanding of why events are taking place? Does it offer further insight into characters? How does it affect the tone of key scenes?)

- Duration:
  - How much longer/shorter would the events depicted in the game be, in real life, than they are within the game, and how does this affect the meaning of these events or the mood of the scene?

- Frequency:
  - Does the game repeat words, images, or events? If so, to what effect?

  - **Generic knowledge**
    - What genre does the game belong to?
    - What genre conventions make this clear to the player?

  - **Intertextuality**
    - Does the game explicitly or implicitly refer to other
specific texts? If so, in what way/s?

- Are these texts games, other types of texts?
- How do these intertextual references affect the way the player would understand the meaning, purpose, or context of the game?

<table>
<thead>
<tr>
<th>Ideology</th>
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<tbody>
<tr>
<td>Are there any ideological issues or beliefs in evidence within the game? If so, what are they?</td>
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<tr>
<td>Would you describe these ideological issues or beliefs as explicit or implicit?</td>
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<tr>
<td>Do they seem to have been incorporated intentionally or unintentionally?</td>
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<tr>
<th>Literacies/ multiliteracies in games</th>
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<tbody>
<tr>
<td>In what way/s is the player allowed, encouraged, or expected to demonstrate their understanding of key concepts, educational or otherwise? (For instance, are they expected to make decisions, write articles, or formulate an argument because of their understanding?)</td>
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<table>
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<tr>
<th>How games structure knowledge and participation</th>
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<tbody>
<tr>
<td>When, and how, is what is expected of the player (in terms of what they must be and do) conveyed to the player?</td>
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<tr>
<td>Are there particular NPCs who are charged with this responsibility?</td>
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<td>What form do these directives take? (On-screen instructions, dialogue, notes left from a long lost relative, etc.)</td>
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<tr>
<td>How does the player know when they have achieved something that was expected? (Rewards, previously inaccessible areas unlocked, allies made, etc.)</td>
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<tr>
<th>Developing critical perspectives on games</th>
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<tbody>
<tr>
<td>Does this game actively and deliberately encourage the player to consider a certain type of game, or games in general, while playing the game? If so, in what ways is this critical reflection encouraged?</td>
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<table>
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<tr>
<th>World around the game</th>
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<tbody>
<tr>
<td>What factors, surrounding game play, have influenced the construction of the game, and where and how it is</td>
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</table>
played?

- What literacy practices are players expected to exhibit during or as a product of playing the game?

- What elements are players required or encouraged to design for use within the game (such as mods)?
- Is the player required to construct more literary-style elements either for or about the game? If so, to what extent do these demonstrate critical understanding of the game’s design as a product?

- What setting is this game intended to be played in? (Is it a lounge room or bedroom, as with a console game, on public transport, like an app, or on location, such as an augmented reality or location-based game?)
- If the setting is mandated, what factors within the setting may affect player experience, and in what ways?
- Who else is assumed to be playing or participating in another (possibly auxiliary) way?

- Does the game have a global reach (such as a massively multiplayer online game)?
- In what social context is the game intended to be played?
- Within this social context, what are the societal/cultural expectations and judgments about this type of game?
- Why might people choose to play the game in certain settings?

- What forms of exchange are there between players of this game (examples include in-game items, background information, hints, and paratexts)?
- What value and/or utility do these have for the members of the community of practice (players and non-players)?
- What skills does the accumulation of gaming capital require of the players/non-players?

- Does the game present the player with simulations that are designed to replicate military thinking or actions?
• Me as games player
  • If so, are these simulations endorsed by the military?
  • How is the player ‘positioned’ by the game?
  • In what way/s is the player allowed/encouraged to accept or resist this positioning?
  • What does the player’s behaviour (if this can be ascertained) suggest about their values, ideology, and identity?
  • What role do they have as player/creator/’reader’?
  • What narrative/visual elements are designed to initially hook the player?
  • What narrative/visual are intended to keep the player invested (emotionally and/or psychologically) throughout the game?
  • In what ways is the player allowed/encouraged to reflect upon their gameplay experience?
  • Are there any other ways, beyond reflection, that the player is encouraged to remain ‘involved’ with the game once the console or app is switched off?

• My involvement as player reader with the game (including engagement and reflection)
  • Involvement with other players (in game / out of game)
  • Physically present/absent, personally known/unknown representations of self and others

• What narrative/visual elements are designed to initially hook the player?
• What narrative/visual are intended to keep the player invested (emotionally and/or psychologically) throughout the game?
• In what ways is the player allowed/encouraged to reflect upon their gameplay experience?
• Are there any other ways, beyond reflection, that the player is encouraged to remain ‘involved’ with the game once the console or app is switched off?
• What interaction is the player allowed/encouraged to have with other players? (Examples include competing or cooperating in real-time, seeking assistance in the form of walkthroughs or other advice, and sharing paratexts.)
• In what way/s are the players allowed/encouraged to initiate and manage this interaction?
• Is the player physically present in the environment, as in a location-based game, or physically absent, as in a console game or app?
• Are other players physically present or absent within the gameplay environment?
• Does the player know who they ‘are’ within the game?
• Are other players visible to the player? If so, how are they represented? (For instance, they might be themselves, as in a location-based game, or they might
<table>
<thead>
<tr>
<th>Category</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identity</td>
<td>What sort of identity is the player invited/encouraged/allowed to explore? How does this relate to his/her identity in the ‘real’ world?</td>
</tr>
<tr>
<td>Learning through games</td>
<td>What are the game makers’ learning intentions?</td>
</tr>
<tr>
<td></td>
<td>How are they realised in this game, using narrative and visual (textual) elements?</td>
</tr>
<tr>
<td>Learning in curriculum areas</td>
<td>What curriculum-based knowledge does the game require the player to learn/demonstrate understanding of?</td>
</tr>
<tr>
<td></td>
<td>What ‘soft skills’ such as collaboration, critical and creative thinking, are they required to develop?</td>
</tr>
<tr>
<td>Serious games</td>
<td>Does the game aim to raise awareness or develop a player’s skills in relation to an ‘applied’ topic that has a connection to the real world (such as advocacy or health)? If so, what is it?</td>
</tr>
<tr>
<td>Learning about learning</td>
<td>In what way/s does the game (whether it is curriculum-based or serious) actively foster learning about learning and metacognition?</td>
</tr>
<tr>
<td>(including metacognition)</td>
<td>Does this game aim to make students think about the way that games and other texts are constructed? If so, in what way/s?</td>
</tr>
</tbody>
</table>
Appendix E: Semi-structured Interview Questions for Writers of Narrative-driven Digital Educational Games in June/July 2015.

Introductory preamble: Thank you very much for agreeing to participate in this study, which will form the basis of my PhD for Deakin University Australia, in which I am considering the role of narrative in narrative-driven digital educational games. The following questions are designed to be quite broad, to give you the latitude to explore each in a way that makes most sense to you. If you don’t like a question or consider it irrelevant or unanswerable based upon your experience, we can skip it; or, if you want to make a different point entirely, that can be accommodated under the final question. You will be given a transcript of this interview, which you can review for accuracy and completeness. When reviewing the transcript, you can also have statements you have made removed, or altered, if you believe that you have divulged commercially sensitive or confidential information. Please note that a transcript of your interview will also be sent to the CEO/Director of your company, who will review it as well prior to analysis for this study.

1. Prior to working in the games industry, did you have experience in working as a writer/storyteller? If so, please describe this experience and what it taught you about telling compelling stories.

2. Since entering the games industry, which educational games have you worked on, and what role/s did you play on each? Please finish by describing your role and responsibilities on the game that we are discussing.

3. What did you hope to accomplish in this game, narratively speaking? How did you attempt to incorporate or play upon the traditional aspects of story (initial hook, structure, plot, characters, compelling themes, setting, motif, etc.)? Please offer as many specific examples as you can.

4. Were there parts of the game in which you consciously attempted to ‘push the boundaries’, narratively speaking? If so, what were they?

5. While working on this game, including during testing, what sort of experience did you imagine the player having? Which features of the game’s story, mechanics, and challenges, did you imagine would make them feel this way?

6. Within this game, were the educational features ever difficult to reconcile with the narrative aspects of the game? If so, please be specific about the challenges you faced, and the strategies you used to resolve these challenges.
7. Did you face any other challenges in relation to writing this game? If so, what were they, and what strategy/ies did you use to address them?

8. This question relates specifically to your game and my perception of one of its key narrative features, which I will raise during the interview.

9. What do you believe are the key characteristics required for somebody who wants to tell stories for educational games? Why do you say this?

10. How do you imagine that narrative-based educational games may change over the next few years? What additional opportunities and challenges will these changes present to those developing the stories for these games?

11. Do you have anything you would like to add?
Appendix F: Plain Language and Consent Form for Educational Game Writers, March 2015.

Plain Language Statement

To: [Insert Name],

I am conducting a study entitled ‘The role of narrative in digital educational games’. This study is comprised of three elements:

- Semi-structured interviews with storytelling experts from the broader games industry;
- An analysis of 5 narrative-driven educational games; and
- Semi-structured interviews with the writers responsible for creating the stories that underpin these games.

Your CEO/Director has suggested that you would be suitable for the latter group because of your work on [Insert Game]. I am interested in speaking to those members of the game design team who were responsible for story elements, including plot, characterisation, and dialogue, as opposed to purely visual elements or gameplay elements (although you may have contributed to the creation of these as well).

By speaking with you, I aim to find out how you view the opportunities and challenges associated with your role as a writer of narrative-driven educational games, and what strategies you have used to create a compelling narrative-based educational game. The aim of this research is to use the input from both groups of participants to develop advice for writers starting out in narrative-based educational games, which will assist them to make their stories as compelling as possible. It is my hope that this will have a real impact upon the game-play experience for students, particularly the sense of engagement they feel when playing these games, and that this might ultimately improve their educational experience. If you agree to take part in this interview, by signing the attached consent form, I will contact you at your convenience via Skype, Google Hangouts, or phone, to ask you around 10 questions. I anticipate that these questions will take 1.5 hours to discuss. I will digitally record our interview, and give you a copy of your interview transcript which you can check for accuracy and completeness. When reviewing the transcript, you can also have statements removed, or altered, if you believe that you have divulged commercially sensitive or confidential information about the game. A copy of your interview transcript will also be sent to the CEO/Director of your company, who will review it as well prior to analysis for this study.

I do not anticipate that there are any risks for you in participating in this research, professional or otherwise, however you may wish to have your data de-identified, meaning that I will use a pseudonym or numerical identifier in place of your name within my PhD and any subsequent publications which stem from the PhD. If you would prefer that I de-identify your data, please make it clear that you do not wish to be identified by name within this research on page 5. Please note that, even if your data is de-identified, it may be possible for people within the industry to deduce your identity based upon statements you make within your interview.

All data collected for this study, including recorded interviews and transcripts, will be stored on a password-protected computer and externally on a password-protected Dropbox site to which only I and my supervisors will have access. I will also entrust a copy of all data
collected to Deakin’s University Services for protection and preservation. I will back-up all data on a regular basis to ensure that data is not lost throughout the process. Any hard-copy data will be kept in a secure filing cabinet at Deakin Burwood. If participants ask for their data to be de-identified, they will be given a numerical identifier, and any documentation linking their name with this identifier will be kept in a separate file to recorded interviews and their transcripts.

Participation in this study is completely voluntary, and all participants have the right to withdraw at any time and ask that their data be withdrawn. I am unable to offer you reimbursement for your time spent on this research study aside from the satisfaction of knowing that you have contributed to a growing area of study: that of improving educational games development.

**Contact me**
[Details removed for privacy]

**Contact my supervisors**
If you need to contact my supervisors for any reason, please use the following contact details:
Dr Joanne O’Mara
Faculty of Arts and Education
School of Education
Deakin University
Melbourne Burwood Campus, VIC
Australia 3217
Phone: +61 3 92446783
joanne.omara@deakin.edu.au

Dr Julianne Moss
Faculty of Arts and Education
School of Education
Deakin University
Melbourne Burwood Campus, VIC
Australia 3217
Phone: +61 3 92446597
julianne.moss@deakin.edu.au

**Complaints**
If you have any complaints about any aspect of the project, the way it is being conducted or any questions about your rights as a research participant, then you may contact:

The Manager, Ethics and Biosafety, Deakin University, 221 Burwood Highway, Burwood Victoria 3125, Telephone: 9251 7129, research-ethics@deakin.edu.au

Please quote project number HAE-15-015.
Consent Form

I have read, and I understand the attached Plain Language Statement.

I freely agree to participate in this project according to the conditions in the Plain Language Statement.

I have been given a copy of the Plain Language Statement and Consent Form to keep.

I DO / DO NOT wish to be named within this research.

Participant’s Name (printed)
..............................................................................................................

Signature ................................................................. Date
............................................................................
Appendix G: Plain Language and Consent Form for CEOs/Directors, March 2015.

Plain Language Statement

To: [Insert Name],

Thank you for accepting my LinkedIn contact request, and for responding to my subsequent invitation to participate in this study, which is entitled ‘The role of narrative in digital educational games’. I understand that your time is very valuable, and appreciate you assisting me with my research. This study is comprised of three elements:

- Semi-structured interviews with storytelling experts from the broader games industry;
- An analysis of 5 narrative-driven educational games; and
- Semi-structured interviews with the writers responsible for creating the narrative elements that underpin these games.

As a CEO or Director of the game design company that created [Insert Game], you are responsible for both the game and the writer/s who wrote one of the games I would like to feature in my study. To do so, I will require the participation of one or more of the game’s writers. By ‘writer’, I am referring to somebody who has been responsible for story elements, including plot, characterisation, and dialogue, as opposed to purely visual elements or gameplay elements (although they may have contributed to the creation of these as well).

By speaking with your staff, I aim to find out how they view the opportunities and challenges associated with their role as a writer of narrative-driven educational games, and what strategies they have used to create a compelling narrative-based educational game. The aim of this research is to use the input from both groups of participants to develop advice for writers starting out in narrative-based educational games, which will assist them to make their stories as compelling as possible. It is my hope that this will have a real impact upon the game-play experience for students, particularly the sense of engagement they feel when playing these games, and that this might ultimately improve their educational experience.

If you agree for your game to be analysed as part of this study, and for your staff member/s to take part in the interview as described above, please sign the attached consent form. I will then email the writer/s to gain their consent to participate. If they agree to participate in the study, I will arrange a convenient time to contact them via Skype, Google Hangouts, or phone, to ask them around 10 questions. I anticipate that these questions will take approximately 1.5 hours per writer to discuss.

Please note that I intend to refer to your game by name within my study. Unless the writer asks me to de-identify them within my study, I would use their real name within my PhD and any subsequent publications that may stem from the PhD.

I do not anticipate that there are any risks for your company in participating in this research, since I am selecting only games that I think exemplify an interesting approach to narrative within educational games, and which differ in significant and interesting ways from the other games I will be featuring. Participation in this study is completely voluntary, and all participants have the right to withdraw at any time and ask that their data be withdrawn; you can also ask me to withdraw your game from analysis.
I will inform your staff that, should they participate, I will give a copy of their interview transcript to you, which you should check for accuracy and completeness. When reviewing the transcript, you can also have statements removed, or altered, if you believe that the writer has divulged commercially sensitive or confidential information about your game.

All data collected for this study, including recorded interviews and transcripts, will be stored on a password-protected computer and externally on a password-protected Dropbox site to which only I and my supervisors will have access. I will also entrust a copy of all data collected to Deakin’s University Services for protection and preservation. I will back-up all data on a regular basis to ensure that data is not lost throughout the process. Any hard-copy data will be kept in a secure filing cabinet at Deakin Burwood. If participants ask for their data to be de-identified, they will be given a numerical identifier, and any documentation linking their name with this identifier will be kept in a separate file to recorded interviews and their transcripts.

I am unable to offer you reimbursement for your company’s participation in this research study aside from the satisfaction of knowing that you have contributed to a growing area of research: that of improving educational games development.

Contact me
[Details removed for privacy]

Contact my supervisors
If you need to contact my supervisors for any reason, please use the following contact details:
Dr Joanne O’Mara
Faculty of Arts and Education
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Australia 3217
Phone: +61 3 92446783
joanne.omara@deakin.edu.au

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School of Education
Deakin University
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Australia 3217
Phone: +61 3 92446597
julianne.moss@deakin.edu.au

Complaints
If you have any complaints about any aspect of the project, the way it is being conducted or any questions about your rights as a research participant, then you may contact:
The Manager, Ethics and Biosafety, Deakin University, 221 Burwood Highway, Burwood Victoria 3125, Telephone: 9251 7129, research-ethics@deakin.edu.au

Please quote project number HAE-15-015.
Organisational Consent Form

I have read, and I understand the attached Plain Language Statement.

I give my permission for:
............................................................................ [please insert staff name/s] of
............................................................................ [please insert your company name] to participate in this project according to the conditions in the Plain Language Statement.

I have been given a copy of Plain Language Statement and Consent Form to keep.

The researcher has informed us that, with their permission, he intends to reveal the participants’ identities (but not their personal details) if information about this project is published or presented in any public form.

I agree that

1. The institution/organisation MAY / MAY NOT be named in research publications or other publicity without prior agreement.

2. I / We EXPECT / DO NOT EXPECT to receive a copy of the research findings or publications.

Name of person giving consent (printed) ..................................................................................

Signature ........................................................................................................ Date .........................
## Appendix H: Critical Review of the Literature Surrounding the Effectiveness of Narrative-driven Digital Educational Games

<table>
<thead>
<tr>
<th>Authors</th>
<th>Country of Origin</th>
<th>Game Purpose</th>
<th>Mode of Delivery</th>
<th>Context for Play: Clinical Setting; Home only; School / Institution; Specific Location</th>
<th>Players per game: Single player; Multiplayer; Both; Group; Single player and Group; Multiplayer and Group; All</th>
<th>Game Genre</th>
<th>Subject Area/s</th>
<th>Overall Outcome</th>
<th>Participant Age</th>
<th>Number of Participants</th>
<th>Duration of Observation</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Adamo-Villani &amp; Wright, 2007)</td>
<td>USA</td>
<td>Educational</td>
<td>Virtual Reality</td>
<td>School / Institution</td>
<td>Single player</td>
<td>Virtual Reality/Puzzle</td>
<td>Science Mathematics Inclusive education</td>
<td>Effective</td>
<td>Primary school age</td>
<td>21</td>
<td>Total time taken to complete the game is not specified, but the mean time to complete one activity within it was 5:26 seconds</td>
<td>Pre test, recorded footage</td>
</tr>
</tbody>
</table>

RESULTS: Participants enjoyed using the application, and were engaged by it, however other learning outcomes are yet to be assessed.
RESULTS: The learning differences between groups were not significant, with the higher number of answers provided by the base group attributed to more time spent on the game. Overall, the researchers concluded that cognitive load and flow should be taken into account if the aim is to enhance processing of information.

RESULTS: Participants playing the game performed worse than those learning via a slideshow on a range of measures, including retention and transfer of knowledge; they also found the game more difficult to use. A detective story was not seen to add value within Experiment 2.
### RESULTS:
The game evoked three types of 'storification': receiving, constructing, and participating. Participation evoked high activity in the game but less awareness of the overall story, which was most readily understood by students who had to construct it. Construction and participation were shown to make the participants more active and motivated during gameplay and, therefore, more engaged.

### RESULTS:
Two systems were evaluated, one without a ‘narrative manager’, and one with this function. The narrative manager provided participants with more problems to solve, but users reported finding its inclusion no more difficult than using the other system. They also found that it made the game more interesting. Knowledge tests revealed that students using the narrative manager had a positive effect upon users’ interest and learning.
<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Setting</th>
<th>Educational Use</th>
<th>School / Institution</th>
<th>Multi-player</th>
<th>Mystery</th>
<th>Science</th>
<th>Mixed</th>
<th>-</th>
<th>-</th>
<th>E</th>
<th>ND</th>
<th>-</th>
<th>-</th>
<th>Secondary school age</th>
<th>Duration</th>
<th>Result Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Annetta, Minogue, Holmes, &amp; Cheng, 2009)</td>
<td>USA</td>
<td>Educational</td>
<td>Computer</td>
<td>School / Institution</td>
<td>Multi-player</td>
<td>Mystery</td>
<td>Science</td>
<td>Mixed</td>
<td>-</td>
<td>-</td>
<td>E</td>
<td>ND</td>
<td>-</td>
<td>-</td>
<td>Secondary school age</td>
<td>129</td>
<td>RESULTS: While post-intervention test scores did not demonstrate a significant difference between students’ understanding of content knowledge, students in the experimental group were shown to be more engaged than those in the control group.</td>
</tr>
<tr>
<td>(Arnab et al., 2013)</td>
<td>GBR</td>
<td>Educational</td>
<td>Computer</td>
<td>School / Institution</td>
<td>Group</td>
<td>RPG</td>
<td>Health: Sex education</td>
<td>Mixed</td>
<td>M</td>
<td>-</td>
<td>-</td>
<td>M</td>
<td>-</td>
<td>-</td>
<td>Secondary school age</td>
<td>505</td>
<td>RESULTS: After playing the game, participants felt that they were more confident in recognising coercion and acting to stop it, with gains in the game group marginally better than those in the control group. For positive attitudes to ‘saying no’, the control group showed greater gains. In relation to understanding personal risk and consequences, the game group showed gains, while the control group did not.</td>
</tr>
</tbody>
</table>
RESULTS: The fact that no significant differences were found between learning conditions suggests that computer-based mentoring can be as effective as 'face-to-face mentoring.

RESULTS: Both the immersive-world dyad and single-user conditions performed significantly better than the electronic textbook group on standardised test items, while the dyad group performed significantly better than expository textbook condition on a performance-based task as well as the standardised test items.
### RESULTS:

While both classes of students showed significant learning gains, the gains were greater (significantly so) in the game group. Other benefits to students in this group were increased engagement and different factors shown to motivate their learning, while for the teacher the benefit was that they had to issue fewer reprimands.

### RESULTS:

Students demonstrated engagement in content, participating in rich scientific discourse and submitting higher quality work as a result. As such, they were able to demonstrate an understanding not only of the concepts, but of the ethics of science.
RESULTS: One hundred percent of participants approved this game design model. Researchers asserted that they had learned the intended lessons and had improved their skills in management. Just over half the students described the experience as pleasant, while almost ninety percent reported higher levels of interest in management after participating. The researchers concluded that this game-based simulation was motivating, practical and fun, and suggested that challenge, visual effects, and time pressure were particularly engaging and entertaining for students.

RESULTS: This program had positive results in two measures: enhancing students’ social skills and emotional understanding, but showed no difference from the control condition in relation to measures regarding facial expression and body-posture recognition. Treatment gains were maintained five months after the initial intervention.
### RESULTS:
After participating, students were better able to reflect upon and apply IT management theories, particularly in relation to project management, budgeting, and the impact of IT projects.

(Bliemel & Ali-Hassan, 2014)

<table>
<thead>
<tr>
<th>CAN</th>
<th>Educational Computer School / Institution Single player Simulation Problem-solving Communicating skills Effective</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>E</th>
<th>-</th>
<th>Mixed ages</th>
<th>Not specified</th>
<th>Approx. 1 hour</th>
<th>Reflective questions</th>
</tr>
</thead>
</table>

### RESULTS:
The findings of this study demonstrated the potential of narrative-driven Augmented Reality science games to foster collaboration skills and flow. While playing, students' flow experience could be observed as a flash of intensity, sense of discovery, and the desire for higher performance. The experience of success within the game led students to crave more success, therefore playing for longer. These effects were observed in both girls and boys. While neither gender nor attitude towards science were shown to be reliable predictors of the variation in flow experience between students, a student’s attitude towards game-playing predicted 23% of the variance in flow experience while playing.

(Bressler & Bodzin, 2013)

<p>| USA | Educational Augmented reality Specific location Group Augmented Reality/ Mystery Science Effective | - | - | - | - | E | E | Secondary school age | 68 | 2 weeks | Pretest, post-test, observation, group interviews |</p>
<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Context</th>
<th>Type</th>
<th>Design</th>
<th>Duration</th>
<th>Participants</th>
<th>Measures</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Brom et al., 2014)</td>
<td>CZE/AUT</td>
<td>Educational Computer School / Institution Single player and Group Simulation Conflict resolution Mixed - - M - M - - Mixed ages 171</td>
<td>7 hours/ 4 hours</td>
<td>Pre-test, Flow Short Scale, Positive and Negative Affect Schedule, Post-test, Four knowledge tests, Social interaction inventory test/ Pre-test, Flow Short Scale, Positive and Negative Affect Schedule, Post-test, Retention tests. All participants were also</td>
<td>RESULTS: Flow was related positively to positive affect and negatively to negative affect, and both were related to learning gains. However, there was no relationship between affect and cortisol levels. In socially anxious boys, both cortisol and negative affect were elevated, suggesting that team games may not be suitable, or might have adverse effects, upon certain learners such as these boys.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Buffum et al., 2016)</td>
<td>USA</td>
<td>Educational Computer School / Institution Group Mystery Computer skills Effective - - - - E - E - Secondary school age</td>
<td>10-15 game play sessions (unit of time NA)</td>
<td>Field observation, survey, knowledge assessment instrument (used as pre and post test)</td>
<td>RESULTS: In this computer science-based intervention, boys initially showed greater learning gains, but girls caught up over the duration of the intervention. Researchers also hypothesised that collaborative activities were linked to a higher level of persistence in students of both genders.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study</td>
<td>Type</td>
<td>Educational</td>
<td>Computer</td>
<td>School / Institution</td>
<td>Single player</td>
<td>Simulation</td>
<td>Computer skills</td>
<td>Effective</td>
</tr>
<tr>
<td>-------</td>
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<td>-----------</td>
</tr>
<tr>
<td>(Chaves et al., 2015)</td>
<td>BRA</td>
<td>Educational Computer School / Institution Single player Simulation Computer skills</td>
<td>-</td>
<td>-</td>
<td>E</td>
<td>-</td>
<td>-</td>
<td>Mixed ages</td>
</tr>
</tbody>
</table>

**RESULTS:** Outcomes of this study suggest that the game had more learning effectiveness than the control condition, which was based upon a project-based instructional model.

<table>
<thead>
<tr>
<th>Study</th>
<th>Type</th>
<th>Educational</th>
<th>Computer</th>
<th>School / Institution</th>
<th>Single player</th>
<th>Simulation</th>
<th>Computer skills</th>
<th>Effective</th>
<th>Mixed ages</th>
<th>Duration</th>
<th>Testing</th>
<th>Questionnaire</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Chee, Tan, &amp; Liu, 2010)</td>
<td>SNG</td>
<td>Educational Mobile application School / Institution Multi-player Strategy Social issues Problem solving Conflict resolution</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>Secondary school age</td>
<td>6</td>
<td>2.5 hours</td>
<td>Interviews</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**RESULTS:** Students reported high levels of enjoyment, learning, and usability. The researchers attributed these positive gains to the students’ growing sense of self-agency and control, meaningful gameplay experience, and satisfaction with the user interface.
RESULTS: Researchers noted that, through the process of inquiry, enacted within the game, students’ perception of science, and of themselves as learners, began to shift. They also saw positive effects upon classroom culture.

RESULTS: While students’ intention and satisfaction with both game conditions, as well as their motivational factors were very similar, and both revealed a significant positive effect upon learning outcomes, the drill-and-practice gaming group scored significantly higher than the roleplaying gaming group on a knowledge test.
<table>
<thead>
<tr>
<th>Cheng, Lin, &amp; She, 2015</th>
<th>TWN</th>
<th>Educational Computer</th>
<th>School / Institution</th>
<th>Single player</th>
<th>Strategy</th>
<th>Science</th>
<th>Effective</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>E</th>
<th>-</th>
<th>-</th>
<th>E</th>
<th>Secondary school age</th>
<th>62</th>
<th>180 minutes</th>
</tr>
</thead>
</table>

**RESULTS:** For students who played the game, learning increased and was maintained in the long term. The time that students spent viewing the relevant information embedded in the game was significantly related to their performance.

<table>
<thead>
<tr>
<th>Cheng, She, &amp; Annetta, 2015</th>
<th>TWN/USA</th>
<th>Educational Computer</th>
<th>School / Institution</th>
<th>Single player</th>
<th>Strategy</th>
<th>Science</th>
<th>Effective</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>E</th>
<th>-</th>
<th>-</th>
<th>E</th>
<th>Secondary school age</th>
<th>260</th>
<th>2 weeks</th>
</tr>
</thead>
</table>

**RESULTS:** Learning outcomes were positively affected by players’ gaming performance, and higher gaming performance was a result of the players’ game immersion experience. Players learned from playing an SEG, but the reliability of the science learning outcomes were not definitive as players became more attached to the game.
RESULTS: During the story, empathy and psychological proximity were established, and immersion and engagement proved to be particularly high during this production. Children answered correctly during a series of historical questions, and the majority of children reported that they enjoyed the aesthetic of the story. Further emotional support is needed, however, as some visitors could not remember any historical facts from the story, surveys indicated.

RESULTS: Learning and engagement were similar across the two countries, suggesting this type of educational games may be useful in science learning across multiple countries. As results showed learning on some measures, along with high engagement, further research is needed to confirm the potential of these games.
<table>
<thead>
<tr>
<th>(Connolly, Stansfield, &amp; Hainey, 2011)</th>
<th>GBR</th>
<th>Educational</th>
<th>Augmented reality</th>
<th>School / Institution</th>
<th>Multi-player</th>
<th>Augmented Reality</th>
<th>Languages other than English</th>
<th>Effective</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>E</th>
<th>-</th>
<th>Secondary school age</th>
<th>328</th>
<th>10 days</th>
<th>Pre and post testing</th>
</tr>
</thead>
</table>

**RESULTS:** Students reported that the ARG encouraged teamwork, collaboration and cooperation, with students believing they had gained new skills across the three areas. The ARG successfully delivered to the students a motivational experience, and most students reported that they would be willing to integrate the game into their foreign language course over a long period.

<table>
<thead>
<tr>
<th>(Couceiro, Papastergiou, Kordaki, &amp; Veloso, 2013)</th>
<th>PRT/GRC</th>
<th>Educational</th>
<th>Computer</th>
<th>School / Institution</th>
<th>Single player</th>
<th>Sports</th>
<th>Science</th>
<th>Effective</th>
<th>-</th>
<th>-</th>
<th>E</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>Tertiary</th>
<th>103</th>
<th>40 minutes</th>
<th>Knowledge questionnaire (as pre and post testing instrument) and feedback questionnaire</th>
</tr>
</thead>
</table>

**RESULTS:** Students’ understanding of concepts such as program, output, input and interplay significantly affected positively by the game prototype, and some students’ previous misconceptions were corrected by playing the prototype. In general, the game as an alternative learning tool was well-accepted, and students’ responses were average to positive on the prototype’s game elements.
<table>
<thead>
<tr>
<th>Source</th>
<th>Location</th>
<th>Type</th>
<th>Platform</th>
<th>Environment</th>
<th>Subject</th>
<th>Age Range</th>
<th>Student Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Dickey, 2011)</td>
<td>USA</td>
<td>Educational Computer</td>
<td>School / Institution</td>
<td>Multi-player RPG/ Mystery Writing</td>
<td>Effective</td>
<td>Secondary school age</td>
<td>20</td>
</tr>
<tr>
<td>(Doucet &amp; Srinivasan, 2010)</td>
<td>USA</td>
<td>Educational Computer</td>
<td>School / Institution</td>
<td>Single player Environmental awareness/ Nature appreciation</td>
<td>Effective</td>
<td>Mixed ages</td>
<td>21</td>
</tr>
<tr>
<td>(Dunleavy, Dede, &amp; Mitchell, 2009)</td>
<td>USA</td>
<td>Educational</td>
<td>Augmented reality</td>
<td>Specific location</td>
<td>Group</td>
<td>Augmented Reality/ Simulation</td>
<td>Mathematics</td>
</tr>
</tbody>
</table>

**RESULTS:** Participants, including students with behavioural and academic challenges, reported that the AR simulation was highly engaging. While the simulation proved to have transformative added value, there were a series of challenges, including managerial, technological and cognitive challenges, for teachers and learners.

| (Echeverria, Barrios, Nussbaum, Amestica, & Leclerc, 2012) | CHL | Educational | Computer | School / Institution | Group | Simulation | Science | Mixed | - | - | - | - | E | - | E | N | ND | Secondary school age | 36 | 3 days | Pre and post testing, Conceptual Survey of Electricity (CSE), Game Experience Questionnaire (GEQ) |

**RESULTS:** Students who played the redesigned game, using the Atomic Intrinsic Integration Approach, experienced fewer conceptual problems and significantly improved results. There were no significant differences between the fantasy and non-fantasy conditions.
<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Location</th>
<th>Type</th>
<th>Specific Location</th>
<th>Group</th>
<th>Augmented Reality</th>
<th>Environmental Awareness/Nature appreciation</th>
<th>Mixed</th>
<th>Duration</th>
<th>Participants</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Facer et al., 2004)</td>
<td>GBR</td>
<td>Educational</td>
<td>Augmented reality</td>
<td>Specific location</td>
<td>Group</td>
<td>Augmented Reality</td>
<td>Environmental awareness/Nature appreciation</td>
<td>Mixed</td>
<td>Duration</td>
<td>Participants</td>
</tr>
<tr>
<td>(Foster &amp; Shah, 2015)</td>
<td>USA</td>
<td>Educational</td>
<td>Computer</td>
<td>School/Institution</td>
<td>Both Single player and Multi-player</td>
<td>Adventure/Puzzle</td>
<td>Mathematics</td>
<td>Mixed</td>
<td>Duration</td>
<td>Participants</td>
</tr>
</tbody>
</table>

**RESULTS:** Through observation, it was confirmed that students were engaged and compelled by their ‘roles’ and ‘environment’. Technical difficulties proved challenging, however, and not all students understood the rules of the game.

**RESULTS:** PCaRD evidently accelerated learning and content identification. Only mathematics resulted with significant knowledge gains and motivation to learn.
<table>
<thead>
<tr>
<th>Country</th>
<th>Educational Institution</th>
<th>Educational Computer</th>
<th>School / Institution</th>
<th>Single Player</th>
<th>Scavenger Hunt</th>
<th>Arts / Creativity</th>
<th>Effective</th>
<th>E</th>
<th>E</th>
<th>E</th>
<th>Secondary School Age</th>
<th>Test</th>
<th>Questionnaire</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUT</td>
<td>Educational Computer</td>
<td>School / Institution</td>
<td>Single player</td>
<td>Scavenger Hunt</td>
<td>Arts / Creativity</td>
<td>Effective</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>Secondary school age</td>
<td>20</td>
<td>NA (two hour art class is mentioned)</td>
<td>Pre and post questionnaires</td>
</tr>
</tbody>
</table>

**RESULTS:** ThIAcro results indicate that students perceived art in a deeper way, and changed the response of the player’s aesthetic interpretation.

<table>
<thead>
<tr>
<th>USA</th>
<th>Educational Learning Management System</th>
<th>School / Institution</th>
<th>Single player</th>
<th>RPG</th>
<th>Work Readiness</th>
<th>Mixed</th>
<th>N</th>
<th>D</th>
<th>E</th>
<th>N</th>
<th>D</th>
<th>E</th>
<th>Tertiary</th>
<th>Test</th>
<th>Questionnaire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frost, Matta, &amp; MacIvor, 2015</td>
<td>USA Educational Learning Management System</td>
<td>School / Institution</td>
<td>Single player</td>
<td>RPG</td>
<td>Work Readiness</td>
<td>Mixed</td>
<td>N</td>
<td>D</td>
<td>E</td>
<td>N</td>
<td>D</td>
<td>E</td>
<td>Tertiary</td>
<td>80</td>
<td>NA</td>
</tr>
</tbody>
</table>

**RESULTS:** The results suggest that gamification had no effect in this study, despite some students reporting that they appreciated some aspects of the gamification. With small effect sizes, student interested and relatedness were significant.
<table>
<thead>
<tr>
<th>Study (Author)</th>
<th>Country</th>
<th>Educational Setting</th>
<th>Activity Type</th>
<th>Subject</th>
<th>Age</th>
<th>Pretest, Posttest, Group Questionnaire Details</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Furió, Juan, Seguí, &amp; Vivó, 2015)</td>
<td>ESP</td>
<td>Educational Augmented reality</td>
<td>School / Institution Single player</td>
<td>Augmented Reality Environmental awareness/ Nature appreciation</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>(Giannakos, 2013)</td>
<td>NOR</td>
<td>Educational Computer</td>
<td>School / Institution Single player</td>
<td>Adventure/ Puzzle Mathematics</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
RESULTS: Especially for students with a lower-than-average performance in mathematics, performance and interest was higher in the story-based math game.

RESULTS: There was a positive correlation between intention to use and enjoyment of the game, with gender being a moderating effect. The results suggest that female players might be more attracted to storytelling components in games.
| (Gomes, Lopes, & de Carvalho, 2013) | PRT | Educational | Computer | School / Institution | Single player | Simulation | Work readiness | Mixed | - | - | - | - | M | E | - | - | Tertiary | 15 | NA | Pre-gameplay instructional slideshow, post-test questionnaire, informal interviews |

**RESULTS:** The results have shown that most players found the game intuitive (80%), realistic (80%), and educationally motivational (67%). Just over half of players (53%) reported that the game helped their understanding of the 5S method. 40% of students thought the subject content should go deeper, supported by 87% of students who thought the game would improve greatly by deepening the contents. All students agreed that this game, and similar others, are an asset in education.

| (González-González & Blanco-Izquierdo, 2012) | ESP | Educational | Computer | School / Institution | Multi-player | MMORPG | Science | Effective | - | - | - | - | - | - | E | Mixed ages | 25/45/17 | Several sessions’ | Post testing |

**RESULTS:** Social learning in gaming communities, regardless of theme or contents, is the most significant type of learning in games. Once a gaming experience has had a substantial duration (beyond "brief"), a social community can develop in any game.
### RESULTS

It was reported that when in a familiar environment, playing as a character was a powerful element in the gaming experience. Participants showed empathy with their characters, reporting that they thought about their characters and their needs during Stage Two of the game. No choices out of character, however, were influenced by their previous characters. When asked about the correlation between their virtual residents and their personal values for Chinatown, participants answered neutrally. The same response was received when asked about thinking about their characters needs in Stages Four-Six.

### RESULTS

The computer story condition produced significantly higher achievement scores in comparison with the paper story. Furthermore, the computer story treatment was significantly more effective than the non-story computer treatment.
**RESULTS:** Despite results of a standardised false-belief test showing a lower level of mentalising capabilities, results show that participants were capable of reasoning and reflecting upon their digital tutee. Participants proved to be engaged and interested in games involving an instructional digital tutee.

**RESULTS:** While 6 aspects of expectation were met for HE learners, only 3 aspects of expectations were met for FE learners. HE learners were more willing to play the game over time and as part of a computing course. In addition, HE learners were more accepting of the game, found it more engaging and promising for the future, were more focused, and had a greater desire to play again.
RESULTS: Participants’ results show computer science knowledge gain after game use. Collaboration amongst students was observed.

RESULTS: Epistemic scripts have educational potential in virtual game environments, as it helped players navigate through the game, and supported some others’ learning outcomes. Between the groups were great variations, despite scripted environment. Further research is needed to clarify how team collaboration and cognitive increase can arise without over-scripting learning.
<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Education Level</th>
<th>Game Type</th>
<th>Subject</th>
<th>Strategy</th>
<th>Mathematics</th>
<th>Effective</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>Secondary School Age</th>
<th>Duration</th>
<th>Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harskamp &amp; Suhre, 2006</td>
<td>NLD</td>
<td>Educational Computer School / Institution Single player Strategy Mathematics</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>E</td>
<td>E</td>
<td>-</td>
<td>Secondary school age</td>
<td>302</td>
<td>4 weeks</td>
<td>Pretesting, observation, posttesting</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RESULTS: Both computer programs showed improvement of problem-solving ability in comparison with traditional mathematics instruction. Despite expectations, both weak and skilled students' quality of problem solving analysis and verification skills improved equally from computer programs.</td>
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<td></td>
</tr>
<tr>
<td>Hickey, Ingram-Goble, &amp; Jameson, 2009</td>
<td>USA</td>
<td>Educational Computer School / Institution Multi-player RPG/ Mystery Science</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>E</td>
<td>-</td>
<td>-</td>
<td>E</td>
<td>-</td>
<td>-</td>
<td>Primary school age</td>
<td>116/ 105</td>
<td>4 weeks</td>
<td>Pre and posttesting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RESULTS: Larger gains in understanding and achievement were demonstrated in one teacher's class using the curriculum when compared with his other two traditionally taught classes. A revised and refined curriculum was then administered to four of his classes showing even greater gains, and results indicated that students who engaged more with their formative feedback showed greater learning and achievement gains.</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
(Homer et al., 2014) | USA | Educational | Console/ Motion tracking software | School / Institution | Single player | Interactive e-book | Vocabulary Literacy | Mixed | - | - | - | M | - | - | Primary school age | 39 | NA (approximately 18 minutes per interactive story with games) | Pre-interview and test, plus self-report administered halfway through. Post-test: vocabulary, definitions and literacy testing, narrative comprehension and character identification tasks.

RESULTS: Significant gains for Active Decoding, Total Reading Score and High Frequency Words were found in both Kinect-Activities and Book Reading groups. Significant gains for Sight Words were only found for Kinect-Activities.

(Hou, 2012) | TWN | Educational | Computer | School / Institution | Multi-player | MMORPG | Learning and practicing English, for non-English speakers | Effective | - | - | - | E | - | E | Primary school age | 100 | 335 days | Auto-record of every in-game action on a database

RESULTS: Through the interactive game, learners have the opportunity for mastery learning, in relation to the frequency distribution of gaming behaviours. MMORPGs, therefore, have a potential as an educational tool, when instructional strategies are employed. From these results, it is suggested that boys and girls may be encouraged to participate in games when they are a scenario-based educational MMORG, and may meet their needs.
| (Hsiao, Chang, Lin, & Hu, 2014) | TWN Educational Computer School / Institution Single player Adventure Science Effective - - - - - - Primary school age 51 9 weeks | Creativity assessment packet, divergent thinking task, flow experience questionnaire |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| **RESULTS:** The DGBL environment showed growth in students’ creativity, generation of flow experiences, and performance on manual skills. The ToES was effective in cultivating creativity, and accelerating improvement of practical behaviours. |

<p>| (Hsu, 2012) | TWN Educational Computer Specific location Multi-player Mixture Science Effective - - - - - - Mixed ages 47 NA | Questionnaire on the Digital Museum for Children (via email or online) |
|-------------|---------------------------------------------------------------------------------------------------------------|
| <strong>RESULTS:</strong> Learning and motivation was inspired by the game-based educational website, and children’s learning effectiveness was enhanced. |</p>
<table>
<thead>
<tr>
<th>Study (Huang, Yeh, Li, &amp; Chang, 2010)</th>
<th>TWN</th>
<th>Educational</th>
<th>Computer</th>
<th>School / Institution</th>
<th>Multiplayer</th>
<th>Puzzle</th>
<th>Arts/ Creativity</th>
<th>Mixed</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>M</th>
<th>Secondary school age</th>
<th>72</th>
<th>One semester</th>
<th>Pre and post testing</th>
</tr>
</thead>
</table>

RESULTS: The SC game and the SC game-agent facilitated diverse problem solving ideas, and were helpful for brainstorming. The divergent thinking process did not immediately transfer to problem solving results. Further research is needed.

<table>
<thead>
<tr>
<th>Study (Huizinga, Admiraal, Akkerma n, &amp; Dam, 2009)</th>
<th>NLD</th>
<th>Educational</th>
<th>Augmented reality</th>
<th>Specific location</th>
<th>Group</th>
<th>Location-based game</th>
<th>History</th>
<th>Mixed</th>
<th>-</th>
<th>-</th>
<th>E</th>
<th>-</th>
<th>E</th>
<th>N</th>
<th>D</th>
<th>-</th>
<th>Secondary school age</th>
<th>458</th>
<th>3 weeks</th>
<th>Engagement questionnaire, motivation questionnaire, Medieval Amsterdam test</th>
</tr>
</thead>
</table>

RESULTS: Game-playing participants were engaged, and acquired significantly more knowledge on the topic of medieval Amsterdam when compared with the other group. There were no significant differences in motivation for history between the two groups.
<table>
<thead>
<tr>
<th>(Hwang, Chiu, &amp; Chen, 2015)</th>
<th>TWN</th>
<th>Educational</th>
<th>Computer</th>
<th>School / Institution</th>
<th>Single player</th>
<th>RPG</th>
<th>Economics</th>
<th>Effective</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>E</th>
<th>E</th>
<th>-</th>
<th>E</th>
<th>Primary school age</th>
<th>87</th>
<th>120 minutes</th>
<th>Pre and post testing (measuring learning style, learning motivation, satisfaction and flow state)</th>
</tr>
</thead>
</table>

**RESULTS:** The approach encouraged students’ gains in knowledge, motivation, flow state and satisfaction. The ‘active’ learning style achieved more in learning from the approach than the ‘reflective’ learning style students.

<table>
<thead>
<tr>
<th>(Hwang, Wu, Chen, &amp; Tu, 2015)</th>
<th>TWN</th>
<th>Educational</th>
<th>Augmented reality</th>
<th>Specific location</th>
<th>Single player</th>
<th>Augmented Reality</th>
<th>Environmental awareness/ Nature appreciation</th>
<th>Effective</th>
<th>E</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>E</th>
<th>-</th>
<th>-</th>
<th>Primary school age</th>
<th>57</th>
<th>NA (works out to take roughly 2 hours)</th>
<th>Pretest on butterfly ecology attitudes and knowledge, post testing</th>
</tr>
</thead>
</table>

**RESULTS:** Results indicated that AR-based games as an educational approach can positively influence learning attitudes and learning performances of students.
<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Educational</th>
<th>Computer</th>
<th>School / Institution</th>
<th>Group</th>
<th>Adventure</th>
<th>Problem solving</th>
<th>Effective</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>E</th>
<th>E</th>
<th>-</th>
<th>-</th>
<th>Secondary school age</th>
<th>NA (&quot;a small sample&quot;)</th>
<th>NA</th>
<th>Pre and post questionnaires</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Iglesias, Fernandez-Manjon, &amp; Fernandez-Varais, 2013)</td>
<td>ESP</td>
<td>Educational</td>
<td>Computer</td>
<td>School / Institution</td>
<td>Single player</td>
<td>Adventure</td>
<td>Arts/ Creativity</td>
<td>Effective</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>E</td>
<td>E</td>
<td>-</td>
<td>-</td>
<td>Secondary school age</td>
<td>NA (&quot;a small sample&quot;)</td>
<td>NA</td>
<td>Pre and post questionnaires</td>
</tr>
</tbody>
</table>

RESULTS: There were no significant findings of this study. There was, however, positive feedback on game performance, playability and pedagogical aspects. Significant technical difficulties need to be resolved before future research.

<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Educational</th>
<th>Computer</th>
<th>School / Institution</th>
<th>Group</th>
<th>Adventure</th>
<th>Problem solving</th>
<th>Effective</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>E</th>
<th>E</th>
<th>-</th>
<th>-</th>
<th>Primary school age</th>
<th>429</th>
<th>7 weeks with 1x45 minute session each two weeks</th>
<th>Pre and post testing, 6-month follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Kajamies, Vauras, &amp; Kinnunen, 2010)</td>
<td>FIN</td>
<td>Educational</td>
<td>Computer</td>
<td>School / Institution</td>
<td>Group</td>
<td>Adventure</td>
<td>Problem solving</td>
<td>Effective</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>E</td>
<td>E</td>
<td>-</td>
<td>-</td>
<td>Primary school age</td>
<td>429</td>
<td>7 weeks with 1x45 minute session each two weeks</td>
<td>Pre and post testing, 6-month follow-up</td>
</tr>
</tbody>
</table>

RESULTS: Significant gains in word problem solving was found with the intervention students when compared to the control groups.
<table>
<thead>
<tr>
<th>Study (Ke, 2008a)</th>
<th>Country</th>
<th>Educational</th>
<th>Computer</th>
<th>School / Institution</th>
<th>Type</th>
<th>Mathematics</th>
<th>Mixed</th>
<th>E</th>
<th>N</th>
<th>D</th>
<th>Primary</th>
<th>Duration</th>
<th>Math Subject</th>
<th>Testing Methodology</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA Educational Computer</td>
<td>Both Puzzle Mathematics Mixed</td>
<td>E</td>
<td>-</td>
<td>-</td>
<td>N</td>
<td>D</td>
<td>-</td>
<td>-</td>
<td>Primary school age</td>
<td>160</td>
<td>4 weeks</td>
<td>Maths exam and inventory on attitudes toward mathematics used as both pre and post testing instruments.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RESULTS: The results show that for game-based learning in cooperative goal structure, there were no significant effects on math test performance, but there was a positive effect in promoting positive maths attitudes. Students were influenced differently in gaming depending on their individual socioeconomic statuses.

<table>
<thead>
<tr>
<th>Study (Ke, 2008b)</th>
<th>Country</th>
<th>Educational</th>
<th>Computer</th>
<th>School / Institution</th>
<th>Type</th>
<th>Mathematics</th>
<th>Mixed</th>
<th>E</th>
<th>N</th>
<th>D</th>
<th>Primary</th>
<th>Duration</th>
<th>Math Subject</th>
<th>Testing Methodology</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA Educational Computer</td>
<td>Single player Puzzle Mathematics Mixed</td>
<td>E</td>
<td>-</td>
<td>-</td>
<td>N</td>
<td>D</td>
<td>-</td>
<td>-</td>
<td>Primary school age</td>
<td>15</td>
<td>5 weeks</td>
<td>Pre testing (Game Skills Arithmetic Test, a modified version of the Attitudes Towards Math Inventory, Junior Metacognitive Awareness Inventory), observations, think-aloud method, document analysis, qualitative data analysis.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RESULTS: More positive attitudes toward math learning developed from math gaming, but gaming had no significant effects on cognitive test performance or metacognitive awareness development. Not every math drill game played engaged children.
<table>
<thead>
<tr>
<th>(Ke &amp; Abras, 2013)</th>
<th>USA</th>
<th>Educational</th>
<th>Computer</th>
<th>School / Institution</th>
<th>Single player</th>
<th>Mixture</th>
<th>Mathematics</th>
<th>Effective</th>
<th>-</th>
<th>-</th>
<th>E</th>
<th>-</th>
<th>-</th>
<th>Secondary school age</th>
<th>9</th>
<th>3 weeks</th>
<th>In-field observations, artifact analysis, school performance report, and three mini knowledge tests administered after each game was played</th>
</tr>
</thead>
</table>

**RESULTS:** The results indicate that students with special learning needs can effectively learn and be engaged while playing educational games, if well designed and used.

<table>
<thead>
<tr>
<th>(Kebritchi, Hirumi, &amp; Bai, 2010)</th>
<th>USA</th>
<th>Educational</th>
<th>Computer</th>
<th>School / Institution</th>
<th>All</th>
<th>Mixture</th>
<th>Mathematics</th>
<th>Mixed</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>E</th>
<th>ND</th>
<th>Secondary school age</th>
<th>103</th>
<th>18 weeks</th>
<th>Motivation surveys, academic achievement tests, interviews</th>
</tr>
</thead>
</table>

**RESULTS:** While there were significant gains in achievement, there was no significant improvement in motivation for the two groups. Playing games in the classroom and lab encouraged greater motivation, according to students’ reports, than those that just played games in school labs. For those in the experimental group, English language and computer skills, as well as prior knowledge, were not significant components in achievement and motivation.
### RESULTS

The results indicate that academic achievement and game performance were strongly affected by the social problem solving ability. Talking and observation activities were more effective for students’ learning and gaming achievements than writing activities. The results support the theory that gaming along with meta-cognitive strategies can improve learning and gaming performance.

### RESULTS

The experimental participants’ writing and speaking abilities were improved compared with those of the control group.
**RESULTS.** With UbiqGames’ goals aiming to engage and promote interest in academic content for students, this study reaches those goals, with results showing that students were interested in learning the academic topics, and remained engaged by the game.

(Korat & Shamir, 2008) ISR Educational Interactive e-Book School / Institution Single player Interactive e-book Vocabulary No Difference - - - - N D - - Primary school age 149 3 weeks Pre and post test interventions of emergent literacy measures including word meaning, word recognition, phonological awareness

**RESULTS.** Results show that the emergent literacy levels of LSES children indicated larger improvement rates than the emergent literacy levels of MSES children. Children who experienced ‘Read with dictionary’ and ‘Read and play’ modes of activity showed more improvement than children who experienced ‘Read story only’ activity mode in their emergent literacy levels. Overall, results indicated that regardless of mode, both MSES and LSES children’s word meaning improved after experiencing the educational e-book activity.
| (Kwon & Lee, 2016) | KOR | Educational | Computer | School / Institution | Single player | Simulation | Work readiness | Inclusive education | Effective | - | - | - | - | E | - | Secondary school age | 47 | NA (mentions 15 minutes between pre and post testing) | Pre, mid and post testing for hands-on task performance |
|----------------------|------|----------------|----------|---------------------|---------------|------------|----------------|---------------------|-----------|----|----|----|----|---|----|----------------------|----|-------------------------------------------------|

**RESULTS:** Increased speed and accuracy of the hands-on task performance is shown in the results of this study. This suggests that simple job skills can be trained in people with developmental disabilities using serious games, and can therefore be integrated into programs that aim to reduce training time and improve accuracy.

<table>
<thead>
<tr>
<th>(Lamb, 2013)</th>
<th>USA</th>
<th>COTS</th>
<th>Mobile application</th>
<th>School / Institution</th>
<th>Single player</th>
<th>Puzzle</th>
<th>Mathematics</th>
<th>Effective</th>
<th>-</th>
<th>-</th>
<th>E</th>
<th>E</th>
<th>-</th>
<th>-</th>
<th>Open to anybody</th>
<th>NA (&quot;My class&quot;)</th>
<th>NA</th>
<th>Observation</th>
</tr>
</thead>
</table>

**RESULTS:** Students were increasingly engaged with Angry Vectors, Angry Parabolas and Angry Projectile Motion, and showed intrinsic motivation to learn mathematical concepts.
<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Type</th>
<th>Platform</th>
<th>Application</th>
<th>Segment</th>
<th>Age</th>
<th>Duration</th>
<th>Method</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Lazarou, 2011)</td>
<td>GBR</td>
<td>Educational</td>
<td>Computer</td>
<td>School / Institution</td>
<td>Groups</td>
<td>Racing</td>
<td>Science</td>
<td>Effective</td>
<td>Primary school age</td>
</tr>
<tr>
<td>(Lee et al., 2016)</td>
<td>KOR/ NZL</td>
<td>Educational</td>
<td>Mobile application</td>
<td>Specific location</td>
<td>Both</td>
<td>Location-based simulation</td>
<td>Work readiness Problem solving</td>
<td>Mixed</td>
<td>Tertiary</td>
</tr>
</tbody>
</table>

**RESULTS:** The prototype was judged to be suitable for students and teachers. For the former, scenario-based learning was seen to be more effective than stand-alone simulations, while for the latter it appeared that it could provide a change in role, from content deliverer to facilitator. In an educational environment, giving both parties an active role to play in the scenario-based environment. Contradictions were quickly resolved.

**RESULTS:** Results showed that for the greatest improvement in critical thinking skills, the implicit cooperation condition was most important. Participants were interested in the content, and results indicate knowledge gains. A larger sample would most likely produce statistically significant results.
<table>
<thead>
<tr>
<th>(Lester et al., 2013)</th>
<th>USA</th>
<th>Educational</th>
<th>Computer</th>
<th>School / Institution</th>
<th>Single player</th>
<th>Action-Adventure</th>
<th>Science</th>
<th>Effective</th>
<th>Pre and post knowledge test, pre and post problem-solving test</th>
</tr>
</thead>
</table>

RESULTS: Results showed an increase in knowledge gains, problem solving skills and engagement, which were consistent for genders.

<table>
<thead>
<tr>
<th>(Liao, Chen, Cheng, Chen, &amp; Chan, 2011)</th>
<th>TWN</th>
<th>Educational</th>
<th>Mobile application</th>
<th>School / Institution</th>
<th>Single player</th>
<th>Strategy</th>
<th>Mathematics</th>
<th>Effective</th>
<th>Pre and post maths testing, face-to-face interviews, recorded footage for observation, Animal Companion Experience Questionnaire for post testing, post maths test administered a third time one month later</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Lim, 2008)</td>
<td>AUS</td>
<td>Educational</td>
<td>Computer</td>
<td>School / Institution</td>
<td>Single player</td>
<td>RPG/ Strategy</td>
<td>English language Mathematics Science</td>
<td>Effective</td>
<td>-</td>
</tr>
<tr>
<td>-------------</td>
<td>-----</td>
<td>-------------</td>
<td>---------</td>
<td>----------------------</td>
<td>--------------</td>
<td>--------------</td>
<td>-----------------------------</td>
<td>----------</td>
<td>---</td>
</tr>
</tbody>
</table>

RESULTS: Motivation to learn, engagement, and social commitments may be enhanced by this approach.

<table>
<thead>
<tr>
<th>(Lindström, Gulz, Haake, &amp; Sjödén, 2011)</th>
<th>SWE</th>
<th>Educational</th>
<th>Computer</th>
<th>School / Institution</th>
<th>Multi-player</th>
<th>Digital Boardgame</th>
<th>Mathematics</th>
<th>Mixed</th>
<th>-</th>
<th>-</th>
<th>E</th>
<th>M</th>
<th>E</th>
<th>E</th>
<th>Primary school age</th>
<th>40</th>
<th>9 weeks</th>
<th>Observations, group discussion</th>
</tr>
</thead>
</table>

RESULTS: Results showed an increase in engagement, and knowledge gains from the experience of Teachable Agents. The TAs as a social entity has the potential to be a negative influence on knowledge gains as they may be downplayed.
| Liu, 2009 | TWN | Educational | Augmented reality/mobile | Specific location | Single player | Location-based game | Learning and practicing English, for non-English speakers | Effective | E | E | E | Secondary school age | 67 | 8 weeks | Pre and post questionnaires, listening and speaking post test, interviews |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

RESULTS: The students in the experimental condition experienced more motivation, more satisfaction, and reported a pleasant experience in learning.

RESULTS: The narrative and incorporated characters helped students relate to the story, influencing decisions made, and ultimately encouraging learning.
<table>
<thead>
<tr>
<th>Study</th>
<th>ESP/COTS</th>
<th>Mixture</th>
<th>School / Institution</th>
<th>Both Mixture</th>
<th>Social Sciences</th>
<th>Game Length</th>
<th>Demographic</th>
<th>Technology</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>(López &amp; Cáceres, 2010)</td>
<td>ESP</td>
<td>COTS</td>
<td>Mixture</td>
<td>School / Institution</td>
<td>Both</td>
<td>Mixture</td>
<td>Social Sciences</td>
<td>Mixed</td>
<td>-</td>
</tr>
<tr>
<td>(Lu, Chang, Kinshuk, Huang, &amp; Chen, 2014)</td>
<td>CAN/TWN</td>
<td>Educational</td>
<td>Context-aware mobile application</td>
<td>School / Institution</td>
<td>Single player</td>
<td>Simulation</td>
<td>Computer skills</td>
<td>Effective</td>
<td>E</td>
</tr>
</tbody>
</table>

RESULTS: Acceptance and motivation from students indicated that the game was positively received. There were some challenges regarding collaboration and rule resistance.

RESULTS: Players’ attitudes and perceived game usefulness were positively influence by the CAM-RPG story.
<table>
<thead>
<tr>
<th>Study (Authors, Year)</th>
<th>Country</th>
<th>Type</th>
<th>Use</th>
<th>School / Institution</th>
<th>Health</th>
<th>Intervention Type</th>
<th>Body Mass Index</th>
<th>Gender</th>
<th>Age</th>
<th>Duration</th>
<th>Testing Method</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Majumdar et al., 2015</td>
<td>USA</td>
<td>Educational</td>
<td>Computer</td>
<td>School / Institution</td>
<td>Multi-player</td>
<td>Unspecified Health: Nutrition</td>
<td>Mixed</td>
<td>-</td>
<td>M</td>
<td>-</td>
<td>E</td>
<td>-</td>
</tr>
<tr>
<td>Manero, Torrente, Serrano, Martinez-Ortiz, &amp; Fernández-Manjon, 2015</td>
<td>ESP</td>
<td>Educational</td>
<td>Computer</td>
<td>School / Institution</td>
<td>Single player</td>
<td>Adventure/Puzzle</td>
<td>Arts/Creativity</td>
<td>Mixed</td>
<td>-</td>
<td>M</td>
<td>-</td>
<td>N</td>
</tr>
</tbody>
</table>

RESULTS: There was a significant reduction in processed foods and sweetened beverages for students who experienced the intervention. There were no changes for other behaviours.

RESULTS: The class with the actor captured students' interest in theatre the most, followed by the video game condition, and then the traditional class condition. Comprehension of the plot and student knowledge was equally improved by both the game condition and the teacher condition.
RESULTS. Technical terms, scientific terms, and relevant language were all better promoted in the extended narrative and character versions, as it was easy to embed in the narrative. The narrative versions were rated as more enjoyable in all aspects by participants.

RESULTS. A strong positive correlation was found between learning satisfaction and motivation, attitude, enjoyment, effort, and quality of the teacher. Learning satisfaction was significantly determined by the degree of translation from in-game experiences to underlying theories. The in-game environment quality did not matter.
<table>
<thead>
<tr>
<th>(Meluso, Zheng, Spires, &amp; Lester, 2012)</th>
<th>USA</th>
<th>Educational</th>
<th>Computer</th>
<th>School / Institution</th>
<th>Both</th>
<th>Puzzle/ RPG</th>
<th>Science</th>
<th>Effective</th>
<th>E</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>Primary school age</th>
<th>100</th>
<th>4 days</th>
<th>Pre and post testing: an adapted version of Self-Regulated Learning Scale, science content knowledge assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESULTS: There was a significant increase in self-efficacy and learning gains from gaming overall, but there were no differences between playing conditions.</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(Nash &amp; Shaffer, 2011)</th>
<th>USA</th>
<th>Educational</th>
<th>Computer</th>
<th>School / Institution</th>
<th>Single player and Group</th>
<th>Simulation</th>
<th>Work readiness</th>
<th>Effective</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>E</th>
<th>-</th>
<th>Secondary school age</th>
<th>14</th>
<th>4 weeks</th>
<th>Pre and post interviews, in-game interactions recorded for analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESULTS: From the modelling of epistemic frames, epistemic network analysis was successful in learning, as players mirrored the mentors' thinking.</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
### Neville, 2015

**USA**

**Educational Computer School / Institution**

**Single player Simulation**

**Writing**

**Effective** - - - - E - - - Tertiary 32 A semester

**Pre and post testing, group discussions, 300 word narrative construction assignment**

**RESULTS:** Results show that the immersion for the experimental group produced more sophisticated and knowledgeable written narratives, indicating a reliance on story maps. Further research is needed as participants’ stylistic and grammatical features could be improved.

### Noorhiddawati, Ghazal Ghalebaandi, & Siti Hajar, 2015

**MYS**

**Multiple games (Educational / COTS)**

**Mobile application**

**School / Institution**

**Single player**

**Mixed NA**

**- - E M E - E - Preschool 18 One week**

**Demographic survey for the parents to fill out, recorded footage for later analysis**

**RESULTS:** Results show that learning for the children involved cognitive processing, such as learning knowledge and intellectual attitude development, psychomotor-based means, such as tactility and movement, and affective means, including emotion, attitudes, and perceived value.
<table>
<thead>
<tr>
<th>(Novak, 2014)</th>
<th>USA</th>
<th>Educational</th>
<th>Learning Management System</th>
<th>School / Institution</th>
<th>Single player</th>
<th>Simulation</th>
<th>Statistics</th>
<th>Mixed</th>
<th>-</th>
<th>-</th>
<th>M</th>
<th>E</th>
<th>-</th>
<th>-</th>
<th>Tertiary</th>
<th>64</th>
<th>NA</th>
<th>Prerequisite knowledge test, post test</th>
</tr>
</thead>
</table>

RESULTS: Both simulation-based interventions’ participants reported higher enjoyment in comparison to traditional learning, and had statistically significant positive effect in knowledge gains. The intervention without a storyline’s students reported higher enjoyment from the simulation than the students from the intervention involving a story. No significant differences in learning outcomes between intervention participants was found.

<table>
<thead>
<tr>
<th>(Novak, Johnson, Tenenbaum, &amp; Shute, 2014)</th>
<th>USA</th>
<th>Educational</th>
<th>Computer</th>
<th>School / Institution</th>
<th>Single player</th>
<th>Simulation</th>
<th>Computer skills</th>
<th>Negative</th>
<th>-</th>
<th>-</th>
<th>N</th>
<th>N</th>
<th>-</th>
<th>-</th>
<th>Tertiary</th>
<th>64</th>
<th>120 minutes per student</th>
<th>Overview of concepts to be practiced, pretest knowledge, post test of knowledge (SDVVR instrument), demographic survey, and simplification of IMMS engagement survey</th>
</tr>
</thead>
</table>

RESULTS: Both simulation conditions had significant learning gains, but the simulation with a storyline did not produce significant results in learning effectiveness, engagement or efficiency improvements.
<table>
<thead>
<tr>
<th>(Okita, 2014)</th>
<th>USA</th>
<th>Educational</th>
<th>Computer</th>
<th>School / Institution</th>
<th>Single player</th>
<th>Puzzle</th>
<th>Mathematics</th>
<th>Effective</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>E</th>
<th>-</th>
<th>E</th>
<th>Primary school age</th>
<th>40/ 22</th>
<th>One hour/ two days</th>
<th>Pre and post testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Pirova no, Mainetti, Baud-Bovy, Lanzi, &amp; Borghese, 2016)</td>
<td>ITA</td>
<td>Educational</td>
<td>Console/ Motion tracking software</td>
<td>Home</td>
<td>Single player</td>
<td>Augmented Reality</td>
<td>Health: Rehabilitation</td>
<td>Effective</td>
<td>-</td>
<td>-</td>
<td>E</td>
<td>-</td>
<td>E</td>
<td>E</td>
<td>Mixed ages</td>
<td>7</td>
<td>NA</td>
<td>Questionnaires</td>
</tr>
</tbody>
</table>

RESULTS: The self-other condition, using ProJo, showed results that calculation time and accuracy improved, along with students monitoring and self-correcting more frequently in the game than the other condition.

RESULTS: All participants reportedly enjoyed the games, rating it positively, and found them stimulating and engaging. Results indicate a sustained level of challenge for participants, while simultaneously demonstrating motivation, safety, and supervision.
RESULTS: Results showed higher performance scores in the simulation task from novice participants, in comparison with experienced participants. Participants of both conditions reported the animated agents as being realistic, helpful, engaging and credible.

(Rosas et al., 2003)  
(Chile) Educational institution  
Handheld gaming system (Nintendo Gameboy Replica)  
Single player  
Reading and Writing Mathematics  
Mixed  
Primary school age  
1274  
3 months  
Preferences survey, reading-and-writing pre and post test, mathematics post test, classroom observation via direct observation and video recording, survey of change expectations as post test for teachers of experimental group.

RESULTS: While there were no significant differences in aspects of Reading Comprehension, Math and Spelling between the internal control group and the experimental group, significant differences were found in those aspects between the external control group, and the experimental and internal control groups. Reports indicate an improvement in motivation, and confirms the experimental tool’s positive transfer.
### RESULTS:
Reports show improvement in computer self-efficacy and skills, and greater computer use. Grade 1 participants experienced greater enjoyment of computers. Small-to medium size univariate effects were robust, for both grades and genders.

### RESULTS:
Participants had an increase in interest of the subject matter, and reported greater knowledge gains. Some students reported that the technology itself was dissatisfying.
<table>
<thead>
<tr>
<th>(Rubino, Barberis, Xhembulla, &amp; Malnati, 2015)</th>
<th>ITA</th>
<th>Educational</th>
<th>Mobile application</th>
<th>Specific location</th>
<th>Single player</th>
<th>Location-based RPG</th>
<th>History</th>
<th>Mixed</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>N</th>
<th>E</th>
<th>E</th>
<th>Mixed ages</th>
<th>37</th>
<th>NA</th>
<th>Questionnaire, semi-structured interviews</th>
</tr>
</thead>
</table>

**RESULTS:** The data log showed the mobile system to be more effective than a multimedia mobile guide. Results indicate that the digital storytelling game was compelling enough to combat reading fatigue, has significant learning potential, and was entertaining and enjoyable. The cultural contents were effectively communicated, and the use of the game lead students to explore the museum more widely. Players’ knowledge gains were mainly superficial.

|----------------------------------------------|-----|-------------|----------|----------------------|---------------|--------|--------|-----------|---|---|---|---|---|---|---|---|------------------|----------------|----------------------|---------------------|

**RESULTS:** Students’ bullying awareness and bullying prevention knowledge improved significantly. Students found the game engaging, enjoyable, and felt confident after use.
<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Setting</th>
<th>Type</th>
<th>Subject</th>
<th>Game Elements</th>
<th>Science</th>
<th>Engagement</th>
<th>Positive Emotions</th>
<th>Negative Emotions</th>
<th>N/A</th>
<th>Age</th>
<th>N/A</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Sabourin &amp; Lester, 2014)</td>
<td>USA</td>
<td>Educational</td>
<td>Computer</td>
<td>School / Institution</td>
<td>Single player</td>
<td>RPG / Mystery</td>
<td>Science</td>
<td>Effective</td>
<td>-</td>
<td>-</td>
<td>E</td>
<td>-</td>
<td>E</td>
</tr>
</tbody>
</table>

RESULTS: The results show that learning, engagement and positive affect promotion are supported in an educational game environment. Learning and motivation are positively correlated with positive emotions, and negative affect states are correlated with disengagement and distraction.

<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Setting</th>
<th>Type</th>
<th>Subject</th>
<th>Game Elements</th>
<th>Science</th>
<th>Engagement</th>
<th>Positive Emotions</th>
<th>Negative Emotions</th>
<th>N/A</th>
<th>Age</th>
<th>N/A</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Sadler, Romine, Menon, Ferdig, &amp; Annetta, 2015)</td>
<td>USA</td>
<td>Educational</td>
<td>Computer</td>
<td>School / Institution</td>
<td>Single player</td>
<td>Simulation</td>
<td>Science</td>
<td>Negative</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>N</td>
</tr>
</tbody>
</table>

RESULTS: While neither computer condition nor narrative condition gained scientific interest, both groups significantly improved their biological content knowledge, as well as showing similar results in time interaction as there was no significant difference.
<table>
<thead>
<tr>
<th>Source</th>
<th>Platform</th>
<th>Grade Level</th>
<th>Age Range</th>
<th>Duration</th>
<th>Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Samso nov, Peder sen, &amp; Hill, 2006)</td>
<td>Educational</td>
<td>Single player and Group</td>
<td>Secondary school age</td>
<td>29 days</td>
<td>USA Educational Computer School / Institution Single player and Group RPG/ Strategy Science Mixed</td>
</tr>
<tr>
<td></td>
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<td>RESULTS: Over a third of students reported the game as being boring and frustrating, with most of these students having prior poor academic performance. The students who found the game engaging, enjoyable and intriguing were the students who completed all the tasks without assistance. These results indicate a correlation between prior academic standard and level of enjoyment.</td>
</tr>
<tr>
<td>(Sánchez &amp; Olivares, 2011)</td>
<td>CHL</td>
<td>Teams</td>
<td>Secondary school age</td>
<td>3 months</td>
<td>CHL Educational Mobile application School / Institution Science Effective</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mixture</td>
<td>373</td>
<td></td>
<td>RESULTS: The experimental group got a higher score in problem solving plan execution, and reported a higher perception of collaboration skills, in comparison to the control group.</td>
</tr>
<tr>
<td>Author and Date</td>
<td>Educational Level</td>
<td>Computer Type</td>
<td>School / Institution</td>
<td>Game Type</td>
<td>Single Player</td>
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</table>

**RESULTS:** The children with special needs were equally attentive in both conditions. The experimental children demonstrated greater gains in experimental words, and positive effects on vocabulary growth was shown.

<table>
<thead>
<tr>
<th>Author and Date</th>
<th>Educational Level</th>
<th>Computer Type</th>
<th>School / Institution</th>
<th>Game Type</th>
<th>Single Player</th>
<th>Interactive e-book</th>
<th>Vocabulary Test</th>
<th>Effective Gain</th>
<th>Post Testing</th>
<th>Condition Duration</th>
<th>Post Testing Method</th>
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</table>

**RESULTS:** Gains in engagement, active attitude, and post-class practice was shown by students who played the game, with all gains being higher than the lecture group. While instruction in the game was effective, there was no significant difference in learning gains between groups.
(Shih, Shih, Shih, Su, & Chuang, 2010) | TWN | Educational | Computer | School / Institution | Teams | Adventure/ Puzzle | Problem solving Collaborati on | Effective | - | - | - | E | - | Primary school age | 4 | NA | Observatio ns from an observatio n room, recorded observatio ns, interviews, game path analysis

RESULTS: Findings reveal that effective learning for individuals occurs within collaboration, with participants’ cognitive performances improving when in a positive collaboration. Slow-achievers could take leadership in collaboration, as participants are inter-dependent in a group.

(Shrimpton & Hurworth, 2005) | AUS | Educational | CD-ROM | Clinical setting | Single player | Adventure | Health: Recovery from psychosis | Mixed | - | - | E | - | M | - | - | Mixed ages | 29 (14 interviewee s, 15 focus group participants) | 1.5 hour interviews, 2 hr focus groups | Face-to-face interviews, focus group discussion s

RESULTS: Pogo’s Pledge participants all voiced their strong support for the psychosis education intervention. The general feedback, however, indicated that participants believed the educational tool could be improved by changing the game induction, navigation, interface design, and a smoother integration of educational content into game play.
<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Educational Level</th>
<th>Type</th>
<th>Subject</th>
<th>Learning Methodology</th>
<th>Age</th>
<th>Duration</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silseth (2011)</td>
<td>NOR</td>
<td>Educational Computer</td>
<td>School / Institution Teams RPG Social issues Collaborati on Effective E - E - E - - Secondary school age 12 4 weeks Video taped session for observatio n</td>
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<tr>
<td>RESULTS: Results indicate that educational gaming is most effective when students' experience of games outside the classroom can be invoked within the classroom environment, and when teachers can accept the role of facilitator to collaborate with students.</td>
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<tr>
<td>Sim, MacFarlane, &amp; Read (2006)</td>
<td>GBR</td>
<td>Educational Computer</td>
<td>School / Institution Single player Mixture Science Effective - - - E E - - E Primary school age 25 3 days Knowledge on 'Life Processes', 'Solar Systems' and a mixture in pre and post tests, observatio n, survey methods including participant s ordering the games from most fun to least, and easiest to use to least</td>
<td></td>
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<tr>
<td>RESULTS: There was a correlation between observed fun and usability, and students successfully differentiated between software quality-related constructs. Learning was not correlated with usability or enjoyment.</td>
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<tr>
<td>(Sindre, Natvig, &amp; Jahre, 2009)</td>
<td>NOR</td>
<td>Educational</td>
<td>Computer</td>
<td>School / Institution</td>
<td>Single player</td>
<td>Quiz</td>
<td>Computer skills</td>
<td>Mixed</td>
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</table>

RESULTS: Perceived learning effect and motivation was reported and observed to be higher for students in the gaming condition. The same amount of time was spent on the learning activities across all conditions, with feedback being provided on potential improvement of complicated questions.

<table>
<thead>
<tr>
<th>(Sisler, Brom, Cuhra, Cinatl, &amp; Gemrot, 2012)</th>
<th>CZE</th>
<th>Educational</th>
<th>Computer</th>
<th>School / Institution</th>
<th>Single player</th>
<th>Adventure</th>
<th>History</th>
<th>Effective</th>
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<th>Secondary school age</th>
<th>71</th>
<th>NA</th>
<th>Questionnaire, group interviews</th>
</tr>
</thead>
</table>

RESULTS: For interest and engagement, the game’s concept was received well, and although comic and video styles were accepted, it is apparent that a 3D multi-player RPG would be the most appreciated style of game. Real story-based storylines were most preferred, with the most positive attitude toward the World War II period, but all time periods received a positive attitude from students.
<table>
<thead>
<tr>
<th>Study (Year)</th>
<th>Country</th>
<th>Setting</th>
<th>Format</th>
<th>Player</th>
<th>Interaction</th>
<th>Reading</th>
<th>Vocabulary</th>
<th>Effectiveness</th>
<th>Duration</th>
<th>Age</th>
<th>Testing</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESULTS:</td>
<td>Overall, the story elicited strong treatment effects on vocabulary. Vocabulary gains were highest with the students who used the interactive animated e-books, followed by students who used the non-interactive animated e-books, and finally the students who used static e-books. Story comprehension was no affected negatively nor positively by interactivity or animations.</td>
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<tr>
<th>Study (Year)</th>
<th>Country</th>
<th>Setting</th>
<th>Format</th>
<th>Player</th>
<th>Interaction</th>
<th>Reading</th>
<th>Vocabulary</th>
<th>Effectiveness</th>
<th>Duration</th>
<th>Age</th>
<th>Testing</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Smith, 2012)</td>
<td>USA</td>
<td>Educational</td>
<td>Interactive e-book</td>
<td>Single player</td>
<td>Puzzle</td>
<td>Literacy</td>
<td>Effective</td>
<td>-</td>
<td>-</td>
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<td>E</td>
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<tr>
<td>RESULTS:</td>
<td>Students who used books with embedded games had significantly higher results on all questions, which included spatial questions, story items, and text-specific spatial questions.</td>
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<tr>
<td>(Smith et al., 2013)</td>
<td>USA</td>
<td>Educational</td>
<td>Interactive e-book</td>
<td>School / Institution</td>
<td>Single player</td>
<td>Interactive e-book</td>
<td>Reading Vocabulary</td>
<td>Effective</td>
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<tr>
<td>(Squire &amp; Jan, 2007)</td>
<td>USA</td>
<td>Educational</td>
<td>Augmented reality/ mobile</td>
<td>Specific location</td>
<td>Group</td>
<td>Augmented Reality/ Mystery</td>
<td>Science</td>
<td>Effective</td>
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<tr>
<td>Author(s)</td>
<td>Country</td>
<td>Educational Level</td>
<td>Computing Environment</td>
<td>Multiplayer</td>
<td>School Institution</td>
<td>Tasks</td>
<td>Age</td>
<td>Time</td>
<td>Tests Administered</td>
<td>Results</td>
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<tr>
<td>Suh, Kim, &amp; Kim, 2010</td>
<td>KOR</td>
<td>Educational Computer School / Institution MMORPG Reading Writing Listening Effective - - - - E - - - Primary school age 302 2 months</td>
<td>A survey, English learning achievement test, motivation test, self-directed skill test, computer use ability test, game skill test</td>
<td>RESULTS: Higher scores for reading, writing and listening skills were found for students who were studying English in conjunction with playing MMORPGs, in comparison to the students in the traditional class. A student’s English learning achievement has shown to be positively affected by motivation, network speed, and prior knowledge.</td>
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<tr>
<td>Sun, Ye, &amp; Wang, 2015</td>
<td>TWN</td>
<td>COTS Mobile application School / Institution Multiplayer Puzzle Science Mixed - - - - M - - - Secondary school age 83 Two weeks</td>
<td>Pre and post concept maps and multiple choice tests, prior game experience questionnaire</td>
<td>RESULTS: Both games successfully promoted physical concepts’ elaboration potential for students. Significant knowledge gains were shown for students who played Cut the Rope, while Angry Birds Space did not show significant learning gains.</td>
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<tr>
<td>(Sung, Hwang, &amp; Yen, 2015)</td>
<td>TWN</td>
<td>Educational Computer</td>
<td>School / Institution</td>
<td>Single player</td>
<td>Simulation</td>
<td>Health</td>
<td>Effective</td>
<td>-</td>
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<td>E</td>
<td>E</td>
</tr>
</tbody>
</table>

**RESULTS:** Students in the experimental group showed gains in learning achievement, motivation, and problem-solving skills. The significant reciprocal interaction showed advance knowledge benefitting students with high motivation more than those with low motivation.

| (ter Vrugte et al., 2015) | NLD/BEL | Educational Computer | School / Institution | Single player | RPG | Mathematics | Effective | - | - | - | E | E | E | - | Mixed ages | 145 | 200 minutes over 4 sessions | an arithmetic test called Tempo Test Rekenen, domain knowledge test, post game perception questionnaire |

**RESULTS:** As proportional reasoning can be demanding for prevocational students with low prior knowledge, who have also proven to have high resistance to learning, it is particularly noteworthy that proportional reasoning skills improved after playing the game. Computer fluency was crucial for improvement. No added value of the support was found, suggesting that the structure may have been too demanding.
<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Educational Level</th>
<th>Computer Hardware</th>
<th>Specific Location</th>
<th>Single/Real-time Data Visualisation</th>
<th>Environment Awareness/Nature Appreciation</th>
<th>Effective</th>
<th>E</th>
<th>Pre- and Post-Test</th>
<th>Tertiary Level</th>
<th>Duration</th>
<th>Method 1</th>
<th>Method 2</th>
<th>Method 3</th>
<th>Tertiary Level 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Tice et al., 2009)</td>
<td>USA</td>
<td>Educational</td>
<td>Computer</td>
<td>Specific location</td>
<td>Single player</td>
<td>Real-time data visualisation</td>
<td>Environment awareness/ Nature appreciation</td>
<td>Effective</td>
<td>E</td>
<td>Pre- and Post-Test</td>
<td>Tertiary</td>
<td>3 months</td>
<td></td>
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<tr>
<td>RESULTS: The results of the intervention showed, in the common sense, significant reductions in electricity use compared to other systems.</td>
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<tr>
<td>(Tüzün, Yılmaz-Soylu, Karakuş, İnal, &amp; Kızılkaya, 2009)</td>
<td>TUR</td>
<td>Educational</td>
<td>Computer</td>
<td>School / Institution</td>
<td>Multi-player and Group</td>
<td>Puzzle/ RPG</td>
<td>Geography</td>
<td>Effective</td>
<td>E</td>
<td>Pre- and Post-Test</td>
<td>Primary school age</td>
<td>3 weeks</td>
<td>Pre test school motivation test, post test game motivation test, pre and post achievement test, open-ended questions observations, informal interviews, recorded footage of gameplay classes</td>
<td></td>
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<tr>
<td>RESULTS: Students in the game condition showed more independence, less focus on getting grades, and achieved significant learning gains. While immersed in the gaming environment, students showed statistically significant higher motivation intrinsically, and statistically significant lower motivation extrinsically.</td>
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<tr>
<td>(Virvou &amp; Katsionis, 2008)</td>
<td>GRC</td>
<td>Educational Virtual Reality</td>
<td>School / Institution</td>
<td>Single player</td>
<td>Virtual Reality/ Adventure</td>
<td>Geography</td>
<td>Mixed</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>E</td>
<td>-</td>
<td>-</td>
<td>M</td>
<td>Primary school age</td>
</tr>
<tr>
<td>(Warren, Dondlinger, &amp; Barab, 2008)</td>
<td>USA</td>
<td>Educational Computer</td>
<td>School / Institution</td>
<td>Multi-player RPG</td>
<td>Writing</td>
<td>Effective</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>E</td>
<td>E</td>
<td>-</td>
<td>E</td>
<td>44</td>
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</tbody>
</table>

**RESULTS:** Results from writing tasks show improved achievement scores, voluntary writing increase, and decrease in teachers’ time spent attending to students with questions.
<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Educational</th>
<th>School / Institution</th>
<th>Teams</th>
<th>Simulation</th>
<th>Problem solving</th>
<th>Mixed</th>
<th>E</th>
<th>M</th>
<th>E</th>
<th>Post</th>
<th>Duration</th>
<th>Weekly</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warren, Dondlinger, McLeod, &amp; Bigenho, 2012</td>
<td>USA</td>
<td>Educational</td>
<td>Augmented Reality</td>
<td>School / Institution</td>
<td>Teams</td>
<td>Simulation</td>
<td>Problem solving</td>
<td>Mixed</td>
<td>E</td>
<td>M</td>
<td>E</td>
<td>Tertiary</td>
<td>Duration of a subject in an undergraduate course: at least “a few weeks”; presumably closer to 10 weeks</td>
<td>Student web log reflections, semi structured interviews with students, course evaluation scale, tech skills achievement pre and post test</td>
</tr>
<tr>
<td>Warren, Dondlinger, Stein, &amp; Barab, 2009</td>
<td>USA</td>
<td>Educational</td>
<td>Computer</td>
<td>School / Institution</td>
<td>Multi- player</td>
<td>RPG</td>
<td>Writing</td>
<td>Effective</td>
<td>-</td>
<td>-</td>
<td>E</td>
<td>-</td>
<td>44</td>
<td>4 weeks</td>
</tr>
</tbody>
</table>

RESULTS: Quantitative results show that students in the treatment group demonstrated greater improvement and statistically significantly higher satisfaction than the comparison course, but overall, collected results were generally mixed on measures of retention, achievement and satisfaction.

RESULTS: Students showed improvement in writing skills, and a significant correlation between engagement and intrinsic motivation became apparent. In-game chat and an overly-controlled gameplay environment by the teacher negatively influenced the session.
<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Educational Level</th>
<th>Computer</th>
<th>School / Institution</th>
<th>Group</th>
<th>Strategy</th>
<th>History</th>
<th>Effective</th>
<th>Data Analysis Method</th>
<th>Duration</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Watson, Mong, &amp; Harris, 2011)</td>
<td>USA</td>
<td>Educational Computer School / Institution Group Strategy History Effective</td>
<td>- - E - -</td>
<td>- -</td>
<td>- -</td>
<td>- -</td>
<td>Secondary school age</td>
<td>98</td>
<td>1 week</td>
<td>Observation, focus groups, interviews, student’s assignment for analysis</td>
<td></td>
</tr>
<tr>
<td>RESULTS: Activity and engagement from students were much higher after the game’s implementation, as the focus from teacher-centred moved to student-centred. Some students even carried their discussion of gaming strategies and experiences outside of the classroom.</td>
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<tr>
<td>(Wilson et al., 2006)</td>
<td>FRA</td>
<td>Educational Computer School / Institution Single player Racing Mathematics Mixed</td>
<td>- - - M E - -</td>
<td>- -</td>
<td>Primary school age</td>
<td>9</td>
<td>5 weeks</td>
<td>Data analysis of in-game activity, observations</td>
<td></td>
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<tr>
<td>RESULTS: Positive feedback indicates the software had the versatility for different levels of knowledge and speed, students’ increase in mathematical confidence, an appreciation of the entertaining animations, deadlines, and sound feedback, and a satisfaction with rewarding elements. Children typically grew bored of the software after 10 hours of use.</td>
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<tr>
<td>Study Source</td>
<td>Country</td>
<td>Grade Level</td>
<td>Group Type</td>
<td>Subject</td>
<td>Duration</td>
<td>Task</td>
<td>Time</td>
<td>Test</td>
<td>Pre Test</td>
<td>Post Test</td>
<td>Abstract</td>
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<tr>
<td>(Wouters, Oostendorp, Boonekamp, &amp; Spek, 2011)</td>
<td>NLD</td>
<td>Educational Computer Home Single player Puzzle Science Mixed</td>
<td>E</td>
<td>E</td>
<td>N</td>
<td>D</td>
<td>-</td>
<td>-</td>
<td>NA (works out to be 30 mins-1 hour)</td>
<td>Post testing of the curiosity questionnaire, open-ended questions for recall information</td>
<td>Results show that although the GDA-supported backstory did not produce significantly higher learning gains than the control, the experimental condition did inspire curiosity from participants.</td>
</tr>
<tr>
<td>(Wrzesien &amp; Alcaniz Raya, 2010)</td>
<td>ESP</td>
<td>Educational Virtual reality display Specific location Group Virtual reality Economics Science Mixed</td>
<td>E</td>
<td>E</td>
<td>N</td>
<td>D</td>
<td>-</td>
<td>-</td>
<td>48</td>
<td>One week including preparatory class, but 70 minutes playing on site</td>
<td>Pre test of biographic informatio, natural science and ecology knowledge test, post test of knowledge, and post test feedback questionnaire, observations</td>
</tr>
<tr>
<td>(Yang, 2015)</td>
<td>TWN</td>
<td>COTS</td>
<td>Computer</td>
<td>School / Institution</td>
<td>Group</td>
<td>Simulation</td>
<td>Work readiness</td>
<td>Effective</td>
<td>Pre and post testing</td>
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**RESULTS:** The experimental group showed significant improvements in problem solving, critical and creative thinking, and academic achievement when compared with the comparison group. The comparison group was effective in encouraging creative thinking and knowledge gains, while the experimental group benefitted employment-related skills most by creating an accurate environment for the knowledge to develop.

| (Yeşilyurt & Kara, 2007) | TUR | Educational | CD-ROM | School / Institution | Single player | Adventure / Puzzle | Science | Mixed | Pre and post testing using the genetic concepts achievement test, biology attitude scale |
| | | | | | | | | | |

**RESULTS:** Students’ biology attitude was significantly changed by the instructional program. The software positively affected students’ knowledge on biology, and produced an increased achievement from the experiment group’s students. Misconceptions remained present among experimental students after the use of software.
| (Zheng, Young, Wagner, & Brewer, 2009) | USA | Educational Computer | School / Institution | Multi-player | RPG | Learning and practicing English, for non-English speakers | Effective | - | - | - | E | E | Secondary school age | 4 (two American girls, two Chinese girls) | The chat log spanned over 10 weeks | Observations, interviews, analysis of game’s artifacts (chat logs) |

RESULTS: While successfully completing quests, participants demonstrated an intercultural collaboration, leading to the formation of meaning and identity, and a series of practices that were also enacted. Language used while navigating each action is what lead to meaning-making.
References (Critical Review):


Sisler, V., Brom, C., Cuhra, J., Cinatl, K., & Gemrot, J. (2012). *Stories from the history of czechoslovakia, a serious game for teaching history of the Czech lands in the 20th century: notes on design concepts and design process*. Bremen, Germany.


