Serious Games: A case study of teacher attitudes and perceptions

Samantha Kotey, B.Des (Hons)

A Capstone project submitted to the University of Dublin, in partial fulfillment of the requirements for the degree of Master of Science in Technology and Learning

2012
Declaration

I declare that the work described in this document is, except where otherwise stated, entirely my own work and has not already been submitted as an exercise for a degree at this or any other university.

Signed: ______________________________

Samantha Kotey, B.Des (Hons)

Date: _______________
Permission to lend and/or copy

I agree that Trinity College Library may lend or copy this Capstone project upon request.

Signed: ______________________________

Samantha Kotey, B.Des (Hons)

Date: ________________
Acknowledgements

I would like to thank Tim Savage for his support and assistance during the supervision of this project and the participants in the 1st Year Masters class in Technology and Learning at Trinity College Dublin.
Table of Contents

Abstract........................................................................................................................................... 7

1. Introduction .................................................................................................................................. 8

2. Literature Review ..................................................................................................................... 10
   2.1 Serious Games for Digital Natives ..................................................................................... 10
   2.2 Negative Perceptions and Attitudes ................................................................................ 10
   2.3 Changing Perceptions and Attitudes with Pedagogy and Experimentation .................... 11
   2.4 Games and Learning ........................................................................................................ 12
      2.4.1 Gagné’s Learning Model .......................................................................................... 12
      2.4.2 Cognitivism Learning Theory ............................................................................... 12
      2.4.3 Games Based Situated Learning (GBSL) ............................................................. 13
      2.4.4 Experiential Learning ............................................................................................ 13
      2.4.5 Behaviorism ........................................................................................................... 13
   2.5 Summary ............................................................................................................................ 14

3. Design .......................................................................................................................................... 15
   3.1 Description of the Serious Game ......................................................................................... 15
      3.1.1 Game Online .......................................................................................................... 15
      3.1.2 Game Objective ....................................................................................................... 15
   3.2 The Pedagogies Underpinning the Design ......................................................................... 15
      3.2.1 Gagné’s “Nine Events Of Instruction” applied to the game .................................... 16
      3.2.2 Level 1: Cognitive Learning Theory ....................................................................... 17
      3.2.3 Level 2: Games Based Situated Learning ............................................................... 17
      3.2.4 Level 3: Experiential Learning ............................................................................... 17
      3.2.5 Level 4: Behaviorism ............................................................................................... 18
   3.3 Walkthrough Guide ............................................................................................................. 18
   3.4 Summary ............................................................................................................................ 18

4. Methodology ............................................................................................................................ 20
   4.1 Research Question ............................................................................................................. 21
   4.2 Research Methodology ...................................................................................................... 21
      4.2.1 Data Collection Tools ............................................................................................ 21
   4.3 Implementation of the Research ....................................................................................... 22
      4.3.1 Research Participants .............................................................................................. 22
      4.3.2 Researcher Bias ....................................................................................................... 22
      4.3.3 Ethics ....................................................................................................................... 22
      4.3.4 Procedure ............................................................................................................... 22
   4.4 Summary ............................................................................................................................ 23

5. Data Analysis & Findings ......................................................................................................... 24
   5.1 Data Preparation ................................................................................................................. 24
   5.2 Pre Questionnaire ............................................................................................................ 24
      5.2.1 Background Information ....................................................................................... 24
      5.2.2 Key Finding ............................................................................................................. 24
   5.3 Game Report ...................................................................................................................... 25
      5.3.1 Learning .................................................................................................................. 25
      5.3.2 Realism .................................................................................................................... 25
      5.3.3 Key Finding ............................................................................................................. 26
   5.4 Post Questionnaire ............................................................................................................ 26
      5.4.1 Perception Changes ................................................................................................. 26
Abstract

The proliferation of games in society has led to an increased interest in the use of serious games for education. Serious games are both educational and entertaining, making them effective tools for teaching the ‘digital native’ generation. Serious games differ from traditional video games as they are designed with specific learning outcomes and objectives, however there is still substantial negativity surrounding the use of video games in schools. Stereotypical myths associated with gaming technology have influenced attitudes and perceptions towards their efficacy by teachers. Perceptions can stem from personal experiences of playing commercial games for fun, which can act as a deterrent for educators when assessing their educational potential. Scholars suggest that negative attitudes can be dispelled, by establishing a foundation of pedagogies in games. The educational benefits of gaming should be a motivator to engage, despite any other obstacles.

This research used a case study to investigate how teacher attitudes and perceptions are affected after experiencing an explicitly pedagogically informed learning game with relevant activities. A 3D serious game was created with the objective of demonstrating well-established pedagogical theories applicable to games such as Gagné's ‘Nine Events of Instruction’, the theory of cognitivism, situational learning, experiential learning and behaviorism. Through the medium itself, participants learned about the pedagogies embedded in games and how these learning theories are applied to game activities.

This case study was conducted using a group of participants with a background in teaching and learning. Participants engaged with an online learning game in an individual setting and were later interviewed about their experience. Data was collected using a mixed method approach in the form of questionnaires, qualitative interviews and gaming activity information.

The findings showed that after playing the game, participant's perceptions about serious games had changed. The research suggested that teachers would benefit from professional development training and a support structure in schools, which would allow them to experiment more with gaming technology. Playing with games would help them to teach with games and accelerate the integration of serious games into classrooms.
1. Introduction

Serious games represent a new genre of educational gaming that has the potential to be effective tools for teaching and learning. The growth and popularity of computer games in society has led to a rising interest about gaming for learning. Serious games are games that are specially designed with learning objectives to educate users while they play entertaining activities. Students become immersed in a virtual environment that motivates them to learn independently and helps develop cognitive functions. Prensky (2001) describes this new generation of learners as ‘Digital Natives’ who are being taught with outdated tools that prohibits education (Prensky 2001). Although the benefits of serious games are compelling, negative attitudes and perceptions about video games in schools are key obstacles to be overcome.

Games are sometimes seen as an entertainment activity or a reward for good behaviour in schools. This perception may stem from teachers personal experiences of gaming for fun, and without any experience to counter this preconception attitudes are difficult to change. Accordingly, the research questions posed in this paper are: ‘How can teacher attitudes and perceptions be changed towards using serious games as teaching tools?’, ‘Which game based pedagogies are effective in changing teachers attitudes and perceptions?’ and ‘Can playing learning games encourage teachers to teach with games?’.

An exploratory case study was chosen as the methodology for this research to explore the integration and embedding of pedagogical theories into games to enhance learning and to investigate how this revelation can affect teacher’s attitudes and perceptions towards serious games. A literature review was conducted to examine the pedagogies applicable to games that resulted in five prominent theorists being chosen as the basis for designing a technology enhanced learning game artifact.

- Gagné’s (1985) ‘Nine Events of Instruction’
- Mayer’s (2002) cognitive theory of multimedia learning
- Lave and Wenger’s situational learning theory (Lave and Wenger 1991)
- Kolb (1984) experiential learning theory
- Skinner’s (1954) operant conditioning

Based on the literature four game levels were developed to showcase the pedagogies applicable to games in a 3D role-playing styled strategy game. Set in a school environment, players engage in a variety of educational activities based around the scenario of a teacher’s first day at school. When each game level is complete, the player is informed about the pedagogy applied to that level to allow for reflection of their game based learning experience. Participants with a background in teaching and learning were invited to take part in the case study which involved following instructions on a website to download and install the game software.
Data was collected using both qualitative and quantitative methods in the form of questionnaires, interviews and gaming activity information. The data analysis highlighted several key findings that showed a change in participant’s attitudes and perceptions, and proposed alternative methods to encourage the use of serious games in education.

Professional development training and peer mentoring are revealed by the research as potential training options to facilitate experimentation with gaming technology through a curriculum based support structure programme. The findings also disclosed that situated learning was the most effective pedagogy in changing attitudes, as learning happened in a real life contextual environment that could not be replicated using static textbooks. The implications of these findings in relation to the research questions are discussed in the final chapter of this paper along with the study limitations and suggestions for further research.
2. Literature Review

Section one of this chapter gives an overview of serious games as teaching tools and why they are suited to the digital native generation. Section two and three examine the negative perceptions and attitudes towards games and recommendations for change. Finally, section four identifies the pedagogies in games and the principles of influential theorists.

2.1 Serious Games for Digital Natives

Serious games are immersive learning environments designed to educate and entertain students while they play (Aldrich 2009). Rejeski and Sawyer (2002) coined the term in their ‘Serious Games Initiative’ whitepaper, describing a new genre of computer gaming in education (Riedel and Hauge 2011). Serious games share several important similarities with commercial computer games, such as providing fun and engaging experiences in single or multiplayer environments. They differ from traditional video games in that they are built with specific learning objectives and goals and facilitate knowledge transfer through entertaining game play (Aldrich 2009).

Game based learning motivates digital native students that have grown up with technology in the information age. Prensky (2001) suggests that educators are teaching a new digital generation with outdated tools, causing many problems in the educational system. He believes that since children grow up with games, then why not teach them with games, as this is their native language (Prensky 2001). Although Prensky’s (2010) ideas are prevalent to the future of educational technology learning, the enhancement that serious gaming technology can bring to education is not being exploited to its full potential by academics (Gibson et al. 2007). The next section will explore how negative perceptions and attitudes can have an effect on teachers’ adoption of serious games.

2.2 Negative Perceptions and Attitudes

Negative perceptions and attitudes are one of the core-contributing factors to the non-acceptance of game based learning in classrooms. Some of the other reasons are based around bureaucratic obstacles, such as insufficient provision of technology, time-consuming lesson planning and lack of support materials (Zapusek et al. 2011). Although these issues are pertinent, the stereotypical myths associated with video games have influenced attitudes and perceptions towards their efficacy by scholars (Baek 2008). From the reviewed literature, three of the most powerful negative perceptions are:

- **Video games make children violent**
  Several research studies have reported the negative effects of gaming on children. Experts have agreed that gaming can result in aggressive behavior, but it can also be attributed to television, movies or social problems (Xue-min et al. 2009). According to Aguilera (2003), the research conducted that spread concern about violent video games, was mainly based in the United States and resulted in disjointed conclusions and a
range of contradicting incomparable studies. Nevertheless, negative perceptions about gaming still exist, and this has impacted on reforming education with the introduction of learning games (Aguilera and Mendiz 2003).

**Games are for entertainment**

Some teachers do not perceive games as teaching tools because of their own personal experience playing commercial video games for amusement. As serious games are a relatively new phenomenon, many teachers will only have experienced games for entertainment purposes throughout their lives. Therefore in a classroom setting, games are perceived as a reward for good behavior and not an activity that should be integrated into a lesson plan (Schrader et al. 2006). Contrary to this perception, a study by Davis (2011), found that students recommended that ‘games should be used more as a teaching method’, as it motivates them to learn and helps improve academic performances (Davis 2011).

**Games are not educational**

Schrader’s (2006) survey on ‘Preservice Teachers’ reports that teachers do not fully understand the extent that pedagogy can be integrated with gaming activities (Schrader et al. 2006). Ketelhut (2011) supports this finding citing that teachers find it difficult to see the correlation between learning theories, games, curriculum and their own approach to teaching (Ketelhut and Schifter 2011). However, according to Sheldon (2011), if teachers embrace the gaming culture, they will always find some subject matter criteria applicable to a gaming scenario (Sheldon 2011). The perception that games are not educational has the greatest potential for change and this will be discussed in the next section.

### 2.3 Changing Perceptions and Attitudes with Pedagogy and Experimentation

Ketelhut (2011) recommends a sustainable solution be implemented with a support structure to allow teachers to become comfortable with this new technology. The support model should include technical support, professional development training and adequate time allocated for learning (Ketelhut and Schifter 2011). Schrader (2006) acknowledges that only through time and experimentation with learning games can perceptions change. He suggests that curriculum programs should be created that include gaming activities to help teachers discover new opportunities and methods of instruction (Schrader et al. 2006).

Prensky’s (2010) recent work has developed the ‘Digital Natives’ concept to give teachers a better understanding of how their students want to learn and their role in facilitating the union of technology and pedagogy (Prensky 2010). In favor of this aspiration, Zapusek (2011) says, “A reasonable way to convince more teachers to try games is through pedagogy”. Teachers need to assimilate proven learning theories with game components to fully understand their learning potential (Zapusek et al. 2011). The next section will identify the characteristics of pedagogical theories that are appropriate for games.
2.4 Games and Learning

According to Gee (2003), computer games support embodied thinking and incorporate a range of learning principles, making them effective tools for teaching and learning (Gee 2003). The design of serious games must include pedagogies to reflect established theorists and proven pedagogical strategies that are widely accepted in academia (Protopsaltis et al. 2011). The following is a review of some of the pedagogies applicable to games.

2.4.1 Gagné’s Learning Model

Gagné’s (1985) ‘Nine Events of Instruction’ was designed to support five categories of learning outcomes; Intellectual skills, verbal information, cognitive strategies, motor skills and attitudes (Gagné 1985). This model can be used a foundation when designing serious games, combining events when necessary (Shabanah and Chen 2009).

*Nine Events of Instruction*

1. Gaining attention (reception)
2. Informing learners of the objective (expectancy)
3. Stimulating recall of prior learning (retrieval)
4. Presenting the stimulus (selective perception)
5. Providing learning guidance (semantic encoding)
6. Eliciting performance (responding)
7. Providing feedback (reinforcement)
8. Assessing performance (retrieval)
9. Enhancing retention and transfer (generalization)

2.4.2 Cognitivism Learning Theory

Cognitive learning theorists (Weiner 1974; Reigeluth 1999; Sweller et al. 2011) agree on the principle that learning involves thinking and that knowledge is constructed upon previous experiences. The cognitivist paradigm compares the mind to a computer, which processes and filters information received from our senses (Wu et al. 2011). Consistent with this concept, Mayer’s (2002) cognitive theory of multimedia learning (Fig 1) offers the idea that learning comes from a combination of words and pictures (Mayer 2002). Gaming technology embeds audio and visual media and offers new opportunities to explore alternative learning styles, compared with conventional learning methods using statics textbooks (Antonopolous et al. 2011).

Research has shown that playing games can help develop a person’s cognitive functions such as spatial ability, visual attention, verbal fluency and memory skills. This is evident in puzzle and adventure games where critical thinking is used to complete challenges and develop strategic moves (Boyan and Sherry 2011).
2.4.3 Games Based Situated Learning (GBSL)

Lave and Wenger's situational learning theory (Lave and Wenger 1991) applies to serious games when learning takes place in a contextual environment. Advancements in technology have meant that realistic virtual surroundings with a high degree of fidelity can be built into games. This supports retention of knowledge and allows users to effortlessly relate lessons learned while playing games, with circumstances that occur in real life (Junjie et al. 2006). Gee (2003) argues that schools often discourage 'situated and embodied thinking' because of old fashioned textbook learning. Students cannot interact with words on a page and have difficulties associating their meaning with perspective situations (Gee 2003).

2.4.4 Experiential Learning

Kolb (1984) introduced an experiential learning theory in an effort to understand the complexity of different learning styles. The Experiential Learning Model (ELM) can be related to games and consists of four distinct stages: concrete learning, reflective observation, abstract conceptualization and active experimentation (Kolb 1984). Games by nature are experiential, as players learn new material, invoke problem-solving skills, engage in decision-making tasks and reflect on their choices in order to accomplish goals (Gouveia et al. 2011).

2.4.5 Behaviorism

According to Skinner's (1954) operant conditioning theory, learning is shaped by positive and negative reinforcement. Learner's are rewarded for good behavior and punished for incorrect choices, making them self aware of the consequences of their actions (Skinner 1954). In line
with this behaviorist learning theory, games are designed to encourage positive behavior, by building in goal objectives with point systems and achievements to rewards for success (Wu et al. 2011).

2.5 Summary

It is clear from the literature that prominent academics (Aldrich, 2009; Gee, 2003; Prensky, 2010) advocate the use of serious games in classrooms. Learning through games offers new opportunities for innovative teaching methods and provides a scaffold for different learning styles. The research has highlighted how pedagogical theories (Mayer, 2002; Lave & Wenger, 1991; Kolb, 1984; Skinner, 1954) can be used in game design to provide a solid foundation that facilitates learning. In spite of these findings teachers are still reluctant to introduce game based learning into their lessons, because of the negative attitudes and perceptions that influence their opinions. Some teachers view games as a non-educational entertainment activity that has a negative impact on children’s behavior.

Prensky (2010) and Zapusek (2011) suggest emphasizing the pedagogical aspects of games, to encourage teachers to experiment and ultimately endorse the technology. Based on this concept, this research project will implement a case study where teachers will engage with a serious game reinforced with pedagogies, including cognitivism, games based situated learning, experiential learning and behaviorism.
3. Design

Building on the analysis of the literature, this chapter describes the development of a serious game, in line with learning principles developed by several pedagogical theorists (Gagné's, 1985; Mayer, 2002; Lave & Wenger, 1991; Kolb, 1984; Skinner, 1954).

3.1 Description of the Serious Game

A 3d learning game was created using the Thinking Worlds authoring tool software. The platform allows developers to create interactions with characters and objects, and program game logic using a visual drag and drop scene flow editor. (See Appendix A to view the game logic flowcharts).

The game was designed using a role-playing strategy to allow the user to become embodied in a virtual environment and identify with objects and characters. The player assumes the role of a new teacher on the first day of school and the principal “Principal Daily” assigns “Mr. Rooney” (the player) tasks and challenges that he must complete before the day is over. At the end of each level, the player is given information on the pedagogy embedded in the game level and when all tasks are finished, “Principal Daily” requests a short reflective report on the player’s experience.

3.1.1 Game Online

The game can be downloaded or viewed online at the following web address:
http://portaldust.com/seriousgames/

3.1.2 Game Objective

The objective of the game was to provide a tailored contextual experience in a school environment that would have a positive affect on preconceptions, and change negative attitudes towards the role of serious games in the classroom. The game was designed to allow teachers to experience a range of educational activities, each built upon a clear and established pedagogy.

3.2 The Pedagogies Underpinning the Design

The objective of the game is to demonstrate the pedagogies applicable in games, so Gagné’s “Nine Events Of Instruction” (Gagné 1985) forms the structure of the game levels (Fig 2). The next section will describe the rationale for the pedagogies in the design process.
3.2.1 Gagné’s “Nine Events Of Instruction” applied to the game.

- (1) & (2) Gaining attention and informing learners of the objective
  At the start of the game, an attention grabbing animation sequence informs the player of their learning objectives, tasks and instructions on how to play the game.

- (3) Stimulating recall of prior learning
  During the game, the player is required to make decisions based on knowledge obtained from previous experience. For example in Level 2 - ‘Break Time’ fire scenario, the player is asked to either ‘Evacuate the Kids’ or ‘Help the Boy’ and must decide on the right approach.

- (4) Presenting the stimulus
  The game itself is visually stimulated using 3D animated characters in an immersive school environment. The player is kept engaged and encouraged to continue through prompts, tasks and interesting activities.

- (5) Providing learning guidance
  Communication messages are displayed to help guide the player through their journey. Supporting this, the principal character is a facilitator to administer tasks.

- (6) Eliciting performance
  In order to progress through the game, the player must interact with objects and non-player characters, by either clicking or walking up to them.
(7) Providing feedback
Feedback is provided in the form of communication messages, prompts, scores and character conversations.

(8) Assessing performance
Assessment is an essential part of the game to keep players motivated to succeed and continue. During the game player's scores are logged and assessed.

(9) Enhancing retention and transfer
Knowledge gained from playing different aspects of the game are transferable to the real world.

Pedagogies & Game Levels

Four game levels were developed with activities to match a specific learning theory. The gaming activities were designed around recommendations previously discussed in the literature.

3.2.2 Level 1: Cognitive Learning Theory
Playing games can help develop cognitive functions such as memory skills (Boyan and Sherry 2011) and learning comes from a combination of words and pictures (Mayer 2002). In order for the participant to experience a serious game that embodies Cognitive learning theory, it was necessary to design a scenario that focused on a specific cognitive function. The Level 1 game that was designed involved a drag and drop picture puzzle game to support the development of memory skills.

3.2.3 Level 2: Games Based Situated Learning
Learning in a contextual environment will help support retention of knowledge (Lave and Wenger 1991), so game Level 2 was designed to replicate a real life scenario allowing the user to make consequential crisis decisions. The player faces a fire scenario in a school café and to heighten the sense of realism, smoke simulations and explosion sounds were incorporated with animated characters.

3.2.4 Level 3: Experiential Learning
There are four stages of learning: concrete learning, reflective observation, abstract conceptualization and active experimentation (Kolb 1984). To support these stages, a branching story with characters relaying information and instant feedback was implemented. The learner is required to complete a task, make a decision, deal with the consequences and reflect on changing their actions.
### 3.2.5 Level 4: Behaviorism

Learning is shaped by positive and negative reinforcement (Skinner 1954). In order to execute this theory, the player is given a set of tasks to complete within a certain time frame. If completed correctly they are rewarded with points and reinforcing statements such as ‘well done’, but if decisions are wrong they receive instant negative feedback from characters.

### 3.3 Walkthrough Guide

The next section details the tasks and objectives of the game. When a level is complete, the player is informed about the learning theory embedded in the task. For example, the following message will appear “This task was an example of cognitive learning”.

- **Introduction**

  The new teacher Mr. Rooney and Principal Daily, engage in a conversation about the tasks to be completed on the first day. The learner is informed of the learning objectives and instructions on how to interact with objects and characters.

- **Level 1: School Event**

  **Task:** There is an event at school and Mr. Rooney is allocated three students to help with the preparation. Each student has a particular skill, which is matched to a specific job. Mr. Rooney must talk to the students about their interests in order to allocate the correct jobs. A drag and drop puzzle game activity is presented to assign work to the students (Fig 3).

  **Objective:** The user will learn about “The Digital Native” students and reflect on the theory of cognitive learning.

![Game Level 1 - Screenshot](image-url)
Level 2: Break Time

Task: A fire breaks out in the school café and a boy is injured. The café is packed with children who are panicking. Mr. Rooney must decide whether to help the boy first or evacuate the children, but if he chooses to help the boy, the fire begins to spread. The school nurse eventually comes to help and Mr. Rooney must put out the fire (Fig 4).

Objective: The user will reflect on the theory of game based situated learning.

Figure 4. Game Level 2 - Screenshot

Level 3: Budgeting

Task: There was a problem with an order for computer equipment. Principal Daily asks Mr. Rooney to redo the order. He must choose between, ‘10 IPads and 12 Laptops’ or ‘20 IPads and 4 Laptops’. Each decision has consequences, as different teachers will be angry about the choices made. If Mr. Rooney orders ‘10 IPads’, Mr. Jones walks in upset, if he orders ‘20 IPads’, Miss Bracken is upset. The player is given the option of changing their order, after reflecting on the decision (Fig 5).

Objective: The user will reflect on the theory of experiential learning.

Figure 5. Game Level 3 - Screenshot
Level 4: Classroom

Task: Mr. Philips asked Mr. Rooney to give the students each a laptop before he leaves. Each laptop must be given to the right student before he gets back. A timer countdown starts and Mr. Rooney must first collect the laptops on the desk. Students will complain if given the wrong laptop and 10 points will be awarded for each correct assignment (Fig 6).

Objective: The user will reflect on the theory of behaviorism.

End Game

Principal Daily congratulates Mr. Rooney on completing his first day and asks him to write a short reflective passage about his experience.

3.4 Summary

The serious game artifact provides an educational experience that allows teachers to pause and reflect on how learning theories can be embedding with games. Through the medium itself, participants can see the correlation between learning objectives and game objectives and how this combination forms a stimulating learning journey.
4. Methodology

This chapter will establish the primary and secondary research questions and describe the methodology used for conducting the research. The final section will explain the implementation of the case study with chosen participants.

4.1 Research Question

This study aims to explore teacher attitudes and perceptions towards using serious games as teaching tools and to investigate changing those perceptions through engagement and pedagogies. Therefore, the research questions are defined as follows:

**Primary Research Question:**
- How can teacher attitudes and perceptions be changed towards using serious games as teaching tools?

**Secondary Research Questions:**
- Which game based pedagogies are effective in changing teachers’ attitudes and perceptions?
- Can playing learning games encourage teachers to teach with games?

4.2 Research Methodology

An exploratory case study was chosen as the methodology for this project due to the style of the research questions and the social topics surrounding personal perceptions. Yin (1994) describes case studies as being suitable method for answering “how” or “why” questions and understanding complex social phenomena (Yin 1994).

Both qualitative and quantitative data collection methods are used in this study. Quantitative research is required for analysing how variables can influence different individuals and their contextual relationships. Quantitative research will facilitate a more in depth exploration of the research questions and will help develop a greater understanding of the participants’ views (Creswell 2011).

4.2.1 Data Collection Tools

The three key data instruments used in this study were questionnaires, reports and interviews. The data provided multiple sources of evidence to recognize correlations between variables and data sets (Yin 1994).

1) **Pre-knowledge questionnaire**

Participants completed a pre questionnaire before playing the learning game in order to assess background information and prior knowledge. Questions were formatted using multiple choice and Likert scale items in the survey.
2) **Game Play Report**
Participants completed an open-ended questionnaire requiring them to write a passage about their experiences in each game level.

3) **Post questionnaire**
Participants completed a post questionnaire, designed using the Likert scale method to determine if attitudes and perceptions had changed after playing the learning game.

4) **Semi Structured interview**
Participants were given the opportunity to engage in discussions arising from topics in the questionnaire and reflect on their personal experiences.

### 4.3 Implementation of the Research

#### 4.3.1 Research Participants
Convenience sampling was used to recruit participants from the first year Masters class in Technology and Learning at Trinity College Dublin and their associated work colleagues. Eight individuals made up of five males and three females were chosen to participate in the case study. All of the participants were active teachers with an interest in educational technology. A pre questionnaire established the age group of children being taught ranged from Junior Infants to Transition year and the most popular subjects were English, History, Math and Science.

#### 4.3.2 Researcher Bias
The researcher is a classmate of some of the participants in the M.Sc. in Technology and Learning. In order to mitigate any potential issues, participants were informed that their unbiased opinion was required.

#### 4.3.3 Ethics
Ethics approval was sought and granted for this study. Participants received an information sheet and a consent form and were made aware of their necessary involvement. (See Appendix B for detailed documents).

#### 4.3.4 Procedure
The serious game artifact was designed to be delivered online, so participants were able to play the game on their home PC’s. A website was set up to guide participants through six clearly labeled instruction steps. Participants were sent the website link via email and given one week to complete the study between April 11th and April 18th 2012.
Steps 1-6 of the online study:

1. Download and read information sheet.
2. Download, read and sign the consent form.
3. Complete a pre survey online. [3 mins]
4. Install and play the game on a PC by either downloading the standalone version or installing a Shockwave or JAVA plug-in and playing the game through a web browser. [15 mins]
5. Complete a reflection report on the website. [5 mins]
6. Complete a post survey. [3 mins]

After completion of the online study participants took part in individual semi structured audio-recorded interviews.

4.4 Summary

The methodology applied to this exploratory case study enabled the research questions to be answered and provided a good source of information for a detailed analysis. The pre and post questionnaires together with the interviews were effective qualitative and quantitative data collection methods for a small group of participants. The next chapter will present the data analysis and discuss the findings.
5. Data Analysis & Findings

This chapter will analyse the data collected during the case study and investigate the findings in relation to the primary and secondary question questions. Each data set will be examined individually and present the resulting outcomes.

5.1 Data Preparation

Data was collected in the form of pre and post questionnaires, an online game report and semi structured interviews (Table 1). The questionnaires were downloaded into a spreadsheet and analysed for results and evidence of correlating themes. The game report data contained paragraphs of text written by the participants that described their experiences while playing the learning game. This data was assimilated into a table and coded for corresponding themes. Finally the audio-recorded interviews were transcribed and coded with meaningful descriptors.

<table>
<thead>
<tr>
<th>Data Collection Tool</th>
<th>Participants</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Survey</td>
<td>8</td>
<td>7 Questions (1 Likert)</td>
</tr>
<tr>
<td>Game Report</td>
<td>8</td>
<td>4 Open ended questions</td>
</tr>
<tr>
<td>Post Survey</td>
<td>8</td>
<td>2 Likert Questions</td>
</tr>
<tr>
<td>Interview</td>
<td>5</td>
<td>44 Minutes</td>
</tr>
</tbody>
</table>

Table 1. Data Collection

5.2 Pre Questionnaire

The purpose of the pre questionnaire was to get an understanding of participant’s backgrounds and to gauge initial perceptions towards learning games.

5.2.1 Background Information

All eight participants were teachers in primary and secondary schools, teaching a broad spectrum of subjects with some specializing in English, Maths and Science. Participants were asked questions regarding prior experiences with games and 50% said they ‘Never’ play video games at all. The other 50% spent from ‘1hr a week to once a month’ playing games on ‘consoles, home computers and mobile devices’. In relation to educational computer games over 60% said they had played such games for the purpose of training or learning.

Table 2 depicts a Likert scale of survey responses showing overall participants were in favour of serious games. Respondents unanimously agreed that learning games engage, motivate and inspire students and 75% agreed gaming technology is useful for teaching and learning.

5.2.2 Key Finding

The pre questionnaire results established that participants were pro gaming enthusiasts in support of game based learning in classrooms. This result is attributed to the background of the sample group who are studying a Masters in Technology and Learning, and are therefore positively disposed to technology in education.
5.3 Game Report

After completion of the serious game activities, participants were asked to reflect on the experience of playing the four game levels. These reports were analysed and coded resulting in the occurrence of two prominent themes (See Appendix C).

5.3.1 Learning

The data analysis confirmed participants were engaged in a learning experience that forced them to respond differently and challenge their thought process. Higher order thinking skills were invoked as scenarios required participant’s full attention and complete involvement of all cognitive senses. This was evident in the first game level where all participants completed the puzzle game correctly. One user noted that people attribute everyday actions to instinct, but in fact it is cognitive processing.

Participants commented on how much they enjoyed the decision-making aspect and would like to have repeated the game in order to make different choices. This shows how gaming can motivate users to learn and reflect on mistakes while still enjoying the experience.

5.3.2 Realism

The game based situated learning was the most successful and popular activity. Participants were immersed in a frantic scenario that mirrored real life and captured the essence of an emergency situation. They were ‘shocked and ‘surprised’ when the microwave blew up and the screaming noises and animations added an extra dimension to the experience. There was a sense of ‘urgency’ to prioritise the evacuation of the kids, a choice made by all eight participants. One of the affordances of serious games is the ability to replicate real life and
train people in environments that are impossible to produce in the real world. The reason this level worked so well was because participants got to experience something quite out of the ordinary, yet totally applicable to their own profession.

5.3.3 Key Finding

The finding showed that participants were most convinced about the effectiveness of serious games when designed with situated learning theories. This addresses the secondary research question ‘Which game based pedagogies are effective in changing teachers’ attitudes and perceptions?’ and indicates there is potential for situated learning pedagogies to enhance learning though games.

5.4 Post Questionnaire

The post questionnaire required participants to agree or disagree with a number of statements to assess a change in perception and to identify potential obstacles in gaming adoption.

5.4.1 Perception Changes

In the first set of statements respondents ‘agreed’ or strongly agreed’ they were more aware of the potential uses of learning games (See Table 3). There was data inconsistency with 25% of teachers agreeing that learning games are a waste of time, yet all agreed they would like to see more learning games being used in schools.

![Bar chart showing participants responses to post questionnaire](image)

Table 3: Participants responses to post questionnaire

5.4.2 integration issues

The second set of statements (Table 4) referred to integration issues and asked participants why learning games are not widely adopted by teachers. The results showed a split in the groups opinions with the only agreement being on the lack of financial resources and technical support in schools. Regarding pedagogies in games, 62.5% agreed that teachers don’t really believe games can be educational and there are not enough relevant and good
quality learning games on the market. 75% respondents also ‘agreed’ or ‘strongly agreed’ that teachers are concerned students will be negatively affected by the integration of games into the classroom.

5.4.3 Key Finding

The post questionnaire results established that although participants have a positive attitude towards game based learning, they recognise the negative perceptions of other teachers are a hindrance. Lack of school resources and teacher support was identified as the main obstacle for adoption.

Table 4: Post questionnaire with question: ‘Integration: The reasons learning games are not widely adopted by teachers is because:’

5.5 Interviews

The interview transcripts were coded with descriptive labels (See example in Appendix D) that were categorised into four themes: Reinforced Learning, Relevance, Peer Influencing and Technology Resources.

5.5.1 Reinforced Learning

Interesting occurrences were the responses about reinforced learning and how instant feedback was a motivator to continue. One participant said “I cannot reinforce 30 kids in the space of time that 20 computers could reinforce them”, meaning that games can enhance learning and even a reduce teachers workload. In agreement with this another participant commented “Kids trust computers more than they do teachers, they will do something without question”.

The findings showed participants’ felt engaged with the virtual environment and this sense of immersion gained their full attention impacting on learning. Supporting the findings of the
game report, the situated learning level surfaced as most popular scenario because that specific topic could not be enforced as effectively through another medium.

5.5.2 Relevance

When interviewed participants spoke about how relevant the role-playing scenarios were to the teaching profession and how they could visualise other potential uses for gaming in their own teaching practice. The finding that relevance is important explains the popularity of the situated learning game level, as it was something that all teachers could face and not confined to a curricular subject.

This idea of relevance directly answers one of the secondary research questions ‘Can playing learning games encourage teachers to teach with games?’ One participant suggested that a way to get teachers involved in gaming is to let them experience game base learning with a topic applicable to their own interests. If they are convinced that learning does happen it will persuade them to engage their students or even build learning games for their own subjects.

5.5.3 Subjective Norm

All the participants talked about how their opinions were affected by other teacher’s views and how teachers were unaware of what gaming technologies are now available. Previous experiences with learning games from years ago were unfavourable, so there is a disincentive to try again even though technology has improved. Suggestions were made about the necessity for professional teacher training or whether at a basic level peer teaching is sufficient. Teachers showcasing their gaming lessons would have a positive impact on teachers’ perceptions and encourage others to experiment. This partly answers the main research questions ‘How can teacher attitudes and perceptions be changed towards using serious games as teaching tools?’ as the impact of subjective norms is strong.

5.5.4 Technology Resources

The theme of technology resources in schools received mixed views from participants. Where there was a distinct lack of computer equipment the participants stated that resources needed to be improved before gaming could be adopted. Other participants in schools with an abundance of resources said they were not being used for what they are capable of. In either case the participants agreed that if gaming were integrated into the curriculum, it would force schools to provide adequate equipment.

5.5.5 Key Findings:

- Games reinforce learning and can reduce teachers’ workloads.
- Teachers need to see the relevance to their own subject areas in learning games.
- Teachers are heavily influenced by the activities undertaken of their peers.
- Curriculum integration would help resolve the issue of resources.
5.6 Unexpected Results

The experiential game level did not emphasis the pedagogy behind it compared with the others. Although users liked the sense of being in ‘Control’ and watching in real time ‘How my decisions could effect people’, the experience would have been heightened if the activity was more realistic allowing users to actually calculate the budget and place an order.

The constant changing in pedagogies from level to level caused some confusion resulting in players becoming disoriented, which affected their game play. This was especially true in the behaviorism game level where many of the participants misunderstood the instructions. The strategy for winning that particular game involved collecting all the laptops at once, but players imposed real world restrictions on the virtual environment instead only collecting one or two laptops at a time.

5.7 Summary

The analysis of the data revealed several key findings resulting in the exploration of the research questions. The implications of these findings and suggestions for further research will be discussed in the next chapter.
6. Discussions & Conclusions

The objective of this paper was to explore teacher attitudes and perceptions towards serious games through the implementation of a case study. This chapter will discuss the implications of the data findings and how they address the research questions.

6.1 Attitudes and Perceptions

The primary research question ‘How can teacher attitudes and perceptions be changed towards using serious games as teaching tools?’ dealt with the concept of changing attitudes and perceptions towards gaming for learning. The participants in the study were pro gaming educationalists that overall had a positive attitude towards serious games. However they recognised the negative attitudes of colleagues and proposed alternative methods for dealing with their shortcomings.

• Professional Development Training and Peer Mentoring

The findings disclosed that subjective norms have significant influence on teachers’ attitudes towards serious games. Teachers are receptive to the views of peers and respect their colleagues’ approaches when dealing with new technologies. Participants talked about embracing the opportunity to learn from more experienced educators and how peer mentoring would help teachers to endorse computer games. Professional development training would also be required to support a peer mentorship programme, which should be structured to include technical support as recommended by Ketelhut (2011).

• Curriculum integration

The post questionnaire results and interviews established that lack of school resources were the main hindrance for the technology adoption. Some participants disagreed with this believing that teacher’s attitudes were the problem, however resources are an issue that cannot be ignored. It was suggested to make game based learning a mandatory part of the curriculum so resources would have to be supplied. Schrader (2006) supports the idea of curriculum programs, as this would force teachers to experiment with serious games for compulsory lesson plans.

• Experimentation

The study found that playing games could encourage educators to teach with games as participants acknowledged they had a different outlook towards games after role-playing in a school game environment. The findings answer the secondary research question and support Schrader (2006) and Prensky (2010) views that perceptions can change with experimentation. Although it is important to note that for experimentation to be effective, the subject matter must be relevant to the teacher involved.
6.2 Pedagogies in Games

The secondary research question ‘Which game based pedagogies are effective in changing teachers’ attitudes and perceptions’ was addressed by designing a serious game with established pedagogical theories to encourage a change in attitude about learning games. However, there was a design fault as users found some difficulty moving and readjusting to each level with a new embedded pedagogy. Nevertheless, the game based situated learning scenario impressed participants the most immersing them in a real life contextual environment, opening their eyes to the potential of serious gaming technology. They acknowledged their experience could never have been replicated through a textbook, aligned with Gee’s (2003) arguments that school don’t encourage ‘situated and embodied thinking’.

Once the participants were able to visualise the possibilities of gaming they became excited about how it could improve their teaching and motivate students to learn independently. In accordance with Skinner’s (1954) operant conditioning theory, games can give instant feedback that shape and reinforce learning thus potentially reducing a teacher’s workload.

Prensky’s (2010) aspiration of marrying technology and pedagogy to encourage teachers worked well for the participants in this case study. The pedagogical aspects made them think not only about what they learned, but how they learned it.

6.3 Limitations of Research

There were two main limitations to the study, the time frame for designing and developing the serious game artifact and the small sample size of the participants. An extended time scale would have allowed for a longer game to be developed giving each level more depth and improving user experience. The research could then have been conducted with a larger number of participants allowing for a more detailed case study to be produced.

6.4 Future Research

This research has investigated teacher attitudes and perceptions towards using serious games as educational tools. The case study implementation highlighted the effectiveness of game based situated learning for mirroring real life experiences in a contextual environment. This is an area for further research and development to explore the potential that gaming technology can bring to education, to help and support teaching and learning.
References


Sheldon, L. (2011). The Multiplayer Classroom: Designing Coursework as a Game, COURSE TECHNOLOGY.


Appendices

Appendix A: Level 2 Game Logic
Appendix B: Ethics

TRINITY COLLEGE DUBLIN
INFORMED CONSENT FORM

LEAD RESEARCHER: Samantha Kotey

BACKGROUND OF RESEARCH:

Serious games are games that are used to educate and entertain students while they play. They differ from traditional video games as they are designed with specific learning outcomes and objectives. The increased use of games in society has lead educators to investigate the potential benefits of game based learning as effective teaching tools. However there is still a lot of negativity surrounding the use of video games in schools and computer games are often perceived as a non-educational entertainment activity that has a negative impact on children’s behavior.

The integration of serious games into classrooms is partially reliant on the acceptance and endorsement by teachers. This study aims to explore teacher attitudes and perceptions towards using serious games as educational tools.

PROCEDURES OF THIS STUDY:

During this study you will be asked to play an online learning game developed on the ThinkingWorlds platform. You will be required to install either Shockwave or JAVA in your web browser which is freely available online, or download a standalone game version. Further technical instructions will be sent out to you regarding the game installation.

Your participation is completely voluntary and you can withdraw from the activity at any time without penalties imposed. If you decide to withdraw, all collected information from your participation will be removed and not included in the research documentation.

In addition each participant needs to provide their consent in written form by signing this document and return it to the researcher.

PUBLICATION:

The results of this research will be published in a dissertation as part of a Master degree in Technology and Learning at the Department of Computer Science and Statistics at Trinity College Dublin in Dublin.

Individual results will be aggregated anonymously and research reported on aggregate results.
DECLARATION:
• I am 18 years or older and am competent to provide consent.
• I have read, or had read to me, a document providing information about this research and this consent form. I have had the opportunity to ask questions and all my questions have been answered to my satisfaction and understand the description of the research that is being provided to me.
• I agree that my data is used for scientific purposes and I have no objection that my data is published in scientific publications in a way that does not reveal my identity.
• I understand that if I make illicit activities known, these will be reported to appropriate authorities.
• I understand that I may stop electronic recordings at any time, and that I may at any time, even subsequent to my participation have such recordings destroyed (except in situations such as above).
• I understand that, subject to the constraints above, no recordings will be replayed in any public forum or made available to any audience other than the current researchers/research team.
• I freely and voluntarily agree to be part of this research study, though without prejudice to my legal and ethical rights.
• I understand that I may refuse to answer any question and that I may withdraw at any time without penalty.
• I understand that my participation is fully anonymous and that no personal details about me will be recorded.
• I understand that if I or anyone in my family has a history of epilepsy then I am proceeding at my own risk.
• I have received a copy of this agreement.

PARTICIPANT’S NAME:

PARTICIPANT’S SIGNATURE:

Date:

Statement of investigator’s responsibility: I have explained the nature and purpose of this research study, the procedures to be undertaken and any risks that may be involved. I have offered to answer any questions and fully answered such questions. I believe that the participant understands my explanation and has freely given informed consent.

RESEARCHERS CONTACT DETAILS:

INVESTIGATOR’S SIGNATURE:

Date:
**Project Title:** Serious Games: A case study of teacher attitudes and perceptions

**Introduction**

Serious games are games that are used to educate and entertain students while they play. They differ from traditional video games as they are designed with specific learning outcomes and objectives. The increased use of games in society has lead educators to investigate the potential benefits of game based learning as effective teaching tools. However there is still a lot of negativity surrounding the use of video games in schools and computer games are often perceived as a non-educational entertainment activity that has a negative impact on children’s behavior.

The integration of serious games into classrooms is partially reliant on the acceptance and endorsement by teachers. This study aims to explore teacher attitudes and perceptions towards using serious games as educational tools.

**Learning activities**

During this study you will be asked to play an online learning game that will be accessible through a website. You will be required to install Shockwave or JAVA in your web browser which is freely available online, or download a standalone game version. Please find below a table with the activities, a short description and the estimated time per activity:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Time in minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Questionnaire</td>
<td>You will fill in an online questionnaire before playing the game.</td>
<td>3 mins</td>
</tr>
<tr>
<td>Plug-In Installation</td>
<td>The JAVA Plug-In or Shockwave Plug-In must be installed to run the game. Or you can download a standalone version.</td>
<td>5 mins</td>
</tr>
<tr>
<td>Game Play</td>
<td>You will be represented by an avatar that will interact with characters on screen and objects by clicking on them.</td>
<td>15 mins</td>
</tr>
<tr>
<td>Report</td>
<td>You will fill in a reflective report on your experience.</td>
<td>5 mins</td>
</tr>
<tr>
<td>Post Questionnaire</td>
<td>You will fill in an online questionnaire regarding your experience</td>
<td>3 mins</td>
</tr>
<tr>
<td>Interview</td>
<td>Opportunity to discuss your experience with other educators.</td>
<td>30 mins</td>
</tr>
</tbody>
</table>
Your Participation

Your participation is completely voluntary and you are not compelled to volunteer by virtue of pressure from interpersonal relationships or professionals management asymmetries. You can withdraw from the activity at any time without penalties imposed. If you decide to withdraw, all collected information from their participation will be removed and not included in the research documentation.

There are no anticipated risks to your involvement in this study. It is anticipated that during the activity you will experience a new technology for teaching and learning in schools.

In addition each participant needs to provide their consent in written form by signing a consent form provided by the researcher. As part of this study, you will be required to install the Adobe Shockwave Plug-In which is freely available online. Further technical instructions will be sent out after you have sent a copy of the signed consent form to the researcher.

Data collection

During the game play participants activities and scores will be logged by the system, this data will be used for analysis. Information will also be collected in the form of questionnaire and interviews. The information will be anonymised and stored in accordance with the Data Protection Act at Trinity College Dublin in Dublin. The information will be analysed and interpreted based on the pedagogy and learning theories underpinning this research project.

In the extremely unlikely event that illicit activity is reported to the researcher during the interview the researcher will be obliged to report it to appropriate authorities. Therefore, please do not mention third parties during the activity or interviews.

The documentation of the findings will be published and disclosed to a body of examiners in Trinity College Dublin as well as external examiners. The researcher will hold a debriefing session after the findings of this project have been published. During this session the collected data and a summary of the analysis will be presented. This session shall also provide you the opportunity to examine how your contributions to the study have been used and interpreted, and to ensure that your contributions have not been used inaccurately or out of context.

Conflict of Interest

The researcher is a classmate of some of the project participants in the M.Sc in Technology and Learning. The data collected during this study will not be used against you in any way.

If you require further information or have questions during or after the research project, please do not hesitate to contact the research at koteys@tcd.ie or 00353-87-6719448
Questions for Pre Online Questionnaire

Please fill out this questionnaire. It should take less than two minutes and there are no wrong answers. *Each question is optional. Feel free to omit a response to any question; however the researcher would be grateful if all questions are responded to.* All of the answers are confidential and will only be used for our internal data analysis.

Please do not name third parties in any open text field of the questionnaire. Any such replies will be anonymised. In the extremely unlikely event that illicit activity is reported I will be obliged to report it to appropriate authorities.

1. **What is your main responsibility in your job?**
   a. Teacher
   b. Principal
   c. Lecturer
   d. Other_________________

2. **What age group of children do you teach?**
   a. Junior Infants
   b. Senior infants
   c. Primary School
   d. Secondary School
   e. Transition year
   f. Other_________________

3. **What subjects do you teach?**

4. **On average, how often would you play video games?**
   a. Never
   b. 1hr a week
   c. 2hrs a week
   d. 5hrs a week
   e. More than 5 hrs a week

5. **What platform do you play games on?**
   a. Console Games –(Xbox, Wii, PlayStation)
   b. PC/Mac Games – (Played on computer rather than console)
   c. Social Games - (i.e Facebook)
   d. Mobile Games – (iPhone/iPad/Android)

6. **Have you ever played a computer game for the purpose of training/learning?**
   a. Yes
   b. No
7. Say to what extent you agree with following statements:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Undecided</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gaming technology is useful for teaching and learning</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Playing learning games in class is a waste of time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Playing learning games can help develop some useful knowledge and skills</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students are less motivated when playing learning games</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning games engage, motivate, and inspire students.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students learn more from books than games</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning games can be applicable to all subject matters</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning games do not have sound pedagogies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Questions for Post Online – Questionnaire

Please fill out this questionnaire. It should take less than two minutes and there are no wrong answers. *Each question is optional. Feel free to omit a response to any question; however the researcher would be grateful if all questions are responded to.* All of the answers are confidential and will only be used for our internal data analysis.

Please do not name third parties in any open text field of the questionnaire. Any such replies will be anonymised. In the extremely unlikely event that illicit activity is reported I will be obliged to report it to appropriate authorities.

**Say to what extent you agree with following statements:**

<table>
<thead>
<tr>
<th>1. Learning Games</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Undecided</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. I am more aware of the potential uses of learning games</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. I think learning games are a waste of time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. I believe games when designed with specific learning objectives can be educational</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. I would never use a learning game in my class</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. I think learning games can help motivate students</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. I was unaware of that games can be designed with learning theories</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. I would like to see more learning games being used in schools</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. Integration

<table>
<thead>
<tr>
<th>The reasons learning games are not widely adopted by teachers is because:</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Undecided</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. I think teachers are not motivated and lazy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. I think teachers need more training</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. I think teachers don’t have time to plan new lessons for learning games</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. I think that teachers don’t believe that games can be educational.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. I find there is a lack of financial resources and technical support in schools for this technology.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. I think teachers are concerned that students will be negatively affected by the integration of games into the classroom</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. I think there are not enough relevant and good quality learning games on the market to use.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Appendix C: Game Report Coding

<table>
<thead>
<tr>
<th>Cognitive Learning</th>
<th>Situated Learning</th>
<th>Experiential Learning</th>
<th>Behaviorism</th>
</tr>
</thead>
<tbody>
<tr>
<td>This game was <strong>interesting</strong> as it underlined that a lot of the actions and decisions we undertake everyday we abstract or disguise, but it is in fact cognitive processing.</td>
<td>Being <strong>intrigued</strong> by the experience really created an engaged, curious, and quite curious bell and animation, I wanted to get through it again.</td>
<td>I would like to look at this level again. I measured the premise behind making the story and now I can see the purpose of the question.</td>
<td>This game certainly expressed the principles of behaviorism. The feedback was noisy and once behaviour and response had been established, the recent noise simply introduced. However, I was slow to set up the simplest idea of feedback when I planned and did not complete the tasks, but I was slow at finding the main point.</td>
</tr>
<tr>
<td>I thought that this was very <strong>intriguing</strong>. I liked how you had to match up the students pictures to their hobbies.</td>
<td>This was a <strong>good</strong> game although the last part of the interface was really high impact. I felt that when the micro-lesson went on for too long, it became a real issue.</td>
<td>I was unsure how the game was based on experiential learning. I had trouble with the game; it was either too easy or too difficult.</td>
<td>I am not sure what the students feel when they look at this game. I also don't think that they shouldn't be making decisions that are based on columns. This would have made the game much easier and it might have given a real result.</td>
</tr>
<tr>
<td>It was easy because you could match each activity to a child's hobby.</td>
<td>This was my first priority as the rest of the kids are to be protected and I also have been helped by the boss if they had to.</td>
<td>I could not find the laptop at first, so I didn't find the person who owned the first one I picked up.</td>
<td>I couldn't find the laptop killed me for it. I did. It didn't find the person who owned the first one I picked up.</td>
</tr>
<tr>
<td>It was <strong>good</strong>.</td>
<td>I would do differently in future.</td>
<td>Need a calculator.</td>
<td>Couldn't figure out how to give a laptop.</td>
</tr>
<tr>
<td>It was too easy to see what the problem was. The idea was somewhat persuasive - give the kids tasks that they like doing and are good at, and make them each contribute something useful.</td>
<td>I went for the fire extinguisher before I was given the option of evacuating either the kids or the boy, the <strong>mood</strong> of the micro-lesson being so influential and I think I would have let it. This was probably the best part of the experiment, though it had also been <strong>terrifying</strong>.</td>
<td>I wasn't sure what I was supposed to do, being a maths teacher. I would have liked a scribble pad to do some calculations and come up with my own answers.</td>
<td>I had some time to do something before we left, or if there were any. I didn't spend the time doing any more, as I really had to fix the kids. I think the kids didn't struggle with the basic instruction, but they started out thinking different.</td>
</tr>
<tr>
<td><strong>Unexpected</strong> concept. I had a lot of pleasure.</td>
<td>Helping me was my first thought but getting students to leave was the priority. Very good concept to make an exit.</td>
<td>I kicked the control of all the money. The choice of having the pads over laptops was that the options available for pads for educational purposes outweigh the laptops.</td>
<td>I was in charge of the game and the lab assistant.</td>
</tr>
<tr>
<td>The game mixes the <strong>rococo</strong> and a good <strong>pedagogy</strong> behind it. The same objectives could be achieved in RL too, however.</td>
<td>Situated learning often very difficult to reinforce, in RL, virtual worlds and games offer excellent opportunity to explore this kind of learning. By not using the user interface, the learning experiences can be achieved with much more familiar methods. However, games clearly provide a wider scope of experience and interaction, which may be higher with this type of framework.</td>
<td>Probably expected the point, given that</td>
<td>I had some time to do something before we left, or if there were any. I didn't spend the time doing any more, as I really had to fix the kids. I think the kids didn't struggle with the basic instruction, but they started out thinking different.</td>
</tr>
<tr>
<td><strong>Positive</strong> feedback.</td>
<td>Situated learning often very difficult to reinforce, in RL, virtual worlds and games offer excellent opportunity to explore this kind of learning.</td>
<td>Situated learning often very difficult to reinforce, in RL, virtual worlds and games offer excellent opportunity to explore this kind of learning.</td>
<td>Situated learning often very difficult to reinforce, in RL, virtual worlds and games offer excellent opportunity to explore this kind of learning.</td>
</tr>
<tr>
<td><strong>looking for</strong>.</td>
<td>It was interesting to see how my <strong>experiences</strong> were with the other people. I decided to keep my mind but realized no one was going to be happy!</td>
<td>It was interesting to see how my <strong>experiences</strong> were with the other people. I decided to keep my mind but realized no one was going to be happy!</td>
<td>It was interesting to see how my <strong>experiences</strong> were with the other people. I decided to keep my mind but realized no one was going to be happy!</td>
</tr>
</tbody>
</table>

**Notes:**
- Interesting
- Instant Feedback
- Nugget real life
- Effective
- Priority decision making
- Figure out learning
- Control
Appendix D: Interview Coding Example

Interview 3

What were your perceptions of games before and after playing the game?

Before I played it I didn’t think they would suit an educational environment in a classroom, I would have thought they would good for learning attention and that they can help certain students learn about more general things, like paying attention, motivate them to start something. But after playing the game it was quite interesting that you can create something very educational, constructed to what you need them to know. And let them figure it out and realize that there’s thinking involved in it. It’s very good.

Would you like to use learning games in your own teaching?

If it could be designed to any topic that I teach, it would be used, cause I know exactly what my students appreciate and like. They have the technology in my school, and in my class we use technology a lot and games are such an important part of what they do and what they like. If they like something and they can learn from it, yeah I would use it.

Do you think games should be an after activity, like a reward?

If they were integrated into the curriculum, I’d see it as more valuable and more worthwhile. You could imagine like when I actually played it I was thinking like if you had an interactive iBook, instead of your normal text book and you had that for even something simple like open up a bank account and went through the scenario of going into the cashier, I was thinking that is a scenario you could teach to students, so much better than reading off a text book. That’s one example I thought about.

It was really fascinating, I was thinking when I got the money, I was excited and then I realized what suits me, The iPads, I was in control there, I liked that. The last bit was about handing out the laptops, and then you realized you were on a timer and it’s a case of trying your best to do it. It was good, it was definitely something that engaged me.

Did you find the learning theories interesting?

I liked the way it made you think in relation to the different theories of what we had been asked. If you can use that technology for kids, which we could say that they do enjoy it more using games, I can see the benefit.
What are the reasons its not being widely adopted by teachers.

Most teachers experience games from their home life. If they on games is playtime and playtime isn't learning time. Even in school during their non class time if kids are on the computers, they are playing games and we know that students don't want to learn when they are not in class, which is obviously not true, but i think that the perceptions that some teachers would have. A game is a game, its not for learning.

How would you get rid of those perceptions?

In relation to most teachers its probably about just showing them. You could talk about it all the time you could tell them you could tell them I use it even in my class its brilliant, their opinion would be your doing, unless they experience it themselves. And not even in relation to a topic for students, something that relates to them to get them interested. If you could bring in teachers and find out their likes and interest they have, design a game for them where they actually learn something, get them thinking. And say, that can be replicated for 12 years to something what they have to learn. There's a possibility that I can see yeah.

I can see how serious games, I like that concept serious games. It would be interesting to see how it develops. I would want to look into it know. Is there stuff out there for my sort of teaching? And what area I'm teaching.

Even just that, the thinking worlds technology, you know about it, cause you're into it, the majority of teachers, don't know about it. I would say if I gave a presentation to 25 teachers in my school, who want to embrace on this and be different, Id say you'd get 5-10% who would go and make a game for their subject. I'm just thinking of random teachers who would love something like that, but they don't know its there. Give them this information that this stuff is there. We have presentations all the time about showing our findings, showing work of what we've done, what way we teach. If someone would show that it would make a huge impact.