

Emergency Management Training For Schools Through Game Based Situated Learning

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A dissertation submitted to the University of Dublin,
in partial fulfillment of the requirements for the degree of
Master of Science in Technology & Learning

2013

Declaration

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

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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 and 2nd Year Masters class in Technology and Learning at Trinity College Dublin. I would like to thank Silvia Gallagher for her advice and my friends and family for support.

Table of Contents

Abstract	8
1. Introduction	9
1.1 Real Life Training Drills	9
1.2 Game Based Training	9
1.3 Research Study	10
2. Literature Review	11
2.1 Emergency Management Planning	11
2.1.1 First Responders	11
2.2 Emergencies in Schools	12
2.2.1 Medical Emergencies	12
2.2.2 Targeted Violence	12
2.2.3 Natural and Man Made Disasters	12
2.3 Serious Games and Learning	13
2.3.1 Simulation Elements	13
2.3.2 Pedagogical and Game Elements	15
2.4 Game Based Teaching	17
2.4.1 Encouraging Games in Schools	18
2.4.2 Professional Development Training	18
2.5 Summary	18
3. Design	20
3.1 Description of the Serious Game	20
3.1.1 Game Online	20
3.1.2 Game Objective	20
3.2 Pedagogies and Game Levels	21
3.2.1 Situated Learning	21
3.2.2 Experiential Learning	22
3.2.3 Behaviorism	22
3.2.4 Cognitive Learning	23
3.3 Walkthrough Guide	23
3.4 Summary	30
4. Methodology	31
4.1 Research Question	31
4.2 Research Methodology	31
4.2.1 Advantages	31
4.2.2 Disadvantages	32
4.2.3 Exploratory versus Explanatory	32
4.2.4 Quantitative and Qualitative Research	32
4.2.5 Data Collection Methods	33
4.2.6 Data Collection Tools	33
4.3 Implementation of the Research	34
4.3.1 Research Participants	34
4.3.2 Researcher Bias	35
4.3.3 Ethics	35
4.3.4 Procedure	35
4.4 Summary	36
5. Data Analysis & Findings	37
5.1 Data Preparation	37
5.2 Pre Questionnaire	37
5.2.1 Background Information	37
5.2.2 Key Finding	38
5.3 Participants' Report	38
5.3.1 Procedural Learning in a Contextual Environment	38
5.3.2 Emotional Learning	40
5.3.3 Learning Through Play	41

5.3.4 Key Finding	41
5.4 Post Questionnaire	42
5.4.1 Learning Games	42
5.4.2 Integration issues	43
5.4.3 Confidence	44
5.4.4 Key Findings	45
5.5 Interviews	45
5.5.1 Decision Making	46
5.5.2 Experiential Learning	46
5.5.3 Immersion	47
5.5.4 Exposure To Technology	47
5.5.5 Key Findings	47
5.6 Unexpected Results	48
5.7 Summary	48
6. Discussions and Conclusions	49
6.1 Emergency Management Training Through Games	49
6.1.1 Situated Learning	49
6.1.2 Crisis Decision Making	50
6.2 Teaching with Games	51
6.3 Limitations of Research	52
6.4 Future Research	52
6.4.1 Types of Games	52
6.4.2 Participants	52
6.4.3 Teaching With Games	53
References	54
Appendices	58
Appendix A: Level 2 Game Logic	58
Appendix B: Ethics	59
Appendix C: Game Report Coding	67
Appendix D: Interview Coding Example	68

List of Figures

Figure 1. Screenshot of emergency medical procedures game	14
Figure 2. Level design with pedagogies	21
Figure 3. Game Level 1: Fire – Screenshot.....	24
Figure 4 and 5. Game Level 1: Fire Extinguishers – Screenshot	24
Figure 6. Game Level 1: Outside – Screenshot	25
Figure 7 and 8. Game Level 2 – Screenshot.....	26
Figure 9. Game Level 3: Decisions – Screenshot	27
Figure 10. Game Level 3: Run – Screenshot	28
Figure 11. Game Level 3: Hide – Screenshot	28
Figure 12 and 13. Game Level 3: Fight – Screenshot.....	29
Figure 14. Research study website with Instructions.	36
Figure 15. Interview Coding Example.....	46

List of Tables

Table 1: Data Collection	37
Table 2: Level 1 Responses	39
Table 3: Level 2 Responses	40
Table 4: Level 3 First Choices	40
Table 5: Learning Games - Post Questionnaire	43
Table 6: Post Questionnaire	44
Table 7: Degree of Confidence Statements	45

Abstract

Educational organizations worldwide are vulnerable to disaster events that threaten the lives of students and teachers. Emergencies can happen at anytime or anywhere in school, so preparation for the unpredictable is imperative to provide a safe and secure learning environment (Hull 2011). Many schools now develop an emergency management plan to have strategies in place for dealing with crisis situations. Some schools fear the threat of hurricanes or tornadoes, while others are subjected to violence or disease (Gainey 2009). Current crisis training methods require students, staff and groups of first responders, to take part in large-scale training drills. Teachers and pupils are the first people on scene of a school emergency and deserve adequate training to prepare for potential life threatening events, while waiting for help to arrive (Djordjevich et al. 2008). However, the approach of real life drills is not practical financially or logistically to carry out, so alternative methods such as game based learning are now being explored.

Serious games are a new genre of gaming that incorporate pedagogical theories making them effective tools for teaching and learning (Aldrich 2009a). Although serious games cannot substitute real world experiences, they can simulate real world environments and replicate objects and characters with a high degree of fidelity (Junjie et al. 2006). These immersive worlds facilitate procedural learning and help develop crisis decision-making skills (Gee 2005), essential for disaster response training.

Accordingly, a research case study was carried out to explore how emergency management training for schools could be implemented through game based situated learning. Participants with a background in education were invited to play a 3D serious game, specifically designed for emergency management training, aligned with the principles of situated learning. The game contained three levels, which simulated a school fire, a medical emergency and a school shooting. As part of the case study, attitudes and perceptions towards game based teaching were examined to investigate if training with games, positively influences teaching practices.

Data was collected using both qualitative and quantitative research methods, resulting in data sets from questionnaires, participants' reports and interviews being produced. The findings revealed that serious games are effective for teaching difficult subject matters such as emotional intelligence and decision-making. The results also showed that trainees could use games for contextual, procedural, experiential and emotional learning. Playing the game allowed educators to experience first hand an educational game infused with pedagogical theories and showcased the benefits of game based learning. The full potential of game based learning for crisis training is examined in this research case study, which aims to demonstrate the affordances of game based learning technologies as an alternative method for emergency management training.

1. Introduction

Emergency management for schools is the practice of preparing, responding and recovering from devastating disasters that occur on school grounds. Man-made and natural disasters take place in every corner of the world and schools are not immune to crisis events that threaten the lives of students and teachers. Consequently, education leaders are now realizing that emergency planning is a high priority and essential for student safety, irrespective of location or institutional size (Gainey 2009). Unfortunately, the importance of emergency management only comes to light after a catastrophic tragedy like the recent school shooting in Newtown, Connecticut, United States, that left twenty-six dead in December 2012 (Scheyder and Cox 2012). There are now calls to establish a sustainable emergency management program for American schools, after the Readiness and Emergency Management for Schools (REMS) funding was cut in 2011-2012 (Solomon and Dvorak 2013).

1.1 Real Life Training Drills

The current method of training for emergency situations involves real life training drills with staff, students and departments of first responders that include fire, medical and police personnel. While this is extremely effective, it is logistically difficult to organize and the expense of such large-scale drills inhibits the prospect of regular training (Djordjevich et al. 2008). Nonetheless, knowledge of procedures and best practice guidelines acquired through training is valuable and can mean the difference between life and death. The first people on scene of a school emergency are the teachers and pupils there while it happened. For this reason, it is crucial that staff are adequately trained to handle unexpected events and given every opportunity to prepare for emergency situations. An alternative training solution to real life drills is the use of serious games specifically designed to teach emergency management.

1.2 Game Based Training

Games are a vehicle for learning with untapped potential for emergency management training. Developments in technology have seen the fidelity of 3D environments vastly improve, accurately reflecting real world objects and circumstances (Aldrich 2009a). By using games as a learning platform, educators are immersed in emergency situations and can role-play a multitude of scenarios without the fear of physical danger. The ability to fail and repeat activities in a safe environment is essential to build confidence in problem-solving skills during a stressful situation. Not all emergencies are full blown disasters, but they are emotional experiences requiring people to be alert and know in advance correct procedures and guidelines. Games facilitate procedural learning and help develop decision-making skills, allowing players to reflect on their choices and learn from mistakes (Gee 2005).

Considering the tremendous potential of games for training and the current problems faced by schools, this research study was carried out to investigate the efficacy of game based learning for emergency management training. Subsequently, one of the side effects of training teachers through games is influencing their attitudes and perceptions towards teaching with games.

1.3 Research Study

The research study conducted posed two questions; *'In what ways can game based learning be used in emergency management training for schools?'* and *'How can game based training encourage the use of games as a teaching methodology?'* To begin the investigation, an extensive review of current literature was carried out to gain a deeper understanding of the principles and pedagogies applied to game based learning, and to look at research studies involving disaster-training games.

Based on recommendations found in the literature, a learning game was designed infused with pedagogical strategies bounded by situated learning. The game was constructed with situated learning scenarios, additionally aligned with distinct pedagogical principles such as behaviorism, cognitive and experiential learning. There are three game levels based on common school emergencies categorized into man-made disasters, medical emergencies and targeted violence. Set in an imaginary virtual school, players follow the story of a schoolteacher asked to complete various tasks and activities, to learn about emergency management. The topics covered in the game are fire safety, anaphylaxis and school shootings, each based on real life situations faced by teachers at school.

Participants with a background in education were invited to play the game on their own PC and answer survey questions before and after the learning experience. The methodology for this research study was an exploratory case study to enable the examination of patterns in data. Both qualitative and quantitative data collection methods were used in the form of questionnaires, participants' reports and semi-structured interviews.

The data was analyzed which resulted in numerous key findings showing that serious games are effective for learning procedural knowledge and practicing crisis decision-making skills. Learning in a contextual environment facilitates repetitive training and provides players with the ability to train emotionally for unexpected events. Further inspection disclosed that training through games would encourage educators to teach with games by allowing them to experience first hand the benefits of game based learning. The research questions and findings of the case study are discussed at length in the final chapter of this research dissertation. A relatively new area of research, this study aims to provide a comprehensive analysis of the prospect of using game based learning for emergency management training.

2. Literature Review

The purpose of the literature review is to establish the context of the study, by identifying different types of emergencies that occur in school and the necessity for training. Serious games have the potential to deliver effective learning experiences for emergency management, but validation of their educational value from scholars is required. For this literature review, online library databases, journals and books are used to search for the latest studies in the field of game based learning, to ensure a differentiation from previous work and to enable the justification of decisions made later on. The review will contain ideas and theories about emergency management training through serious games and this information will be the foundation of the research study.

Section one and two give an overview of emergency management planning and the types of emergencies that can occur in schools. Section three examines the simulation, pedagogical and game elements of serious games and finally section four looks at game based teaching and encouraging games in schools.

2.1 Emergency Management Planning

Educational institutions worldwide have a responsibility to ensure the safety and security of their students. Unfortunately over the last decade dozens of schools and colleges have been subjected to catastrophic tragedies, resulting in the mass loss of lives e.g. Connecticut, Columbine and Virginia Tech. In preparation for the unpredictable, many schools now develop an emergency management plan in anticipation of crisis events (Gainey 2009). There are four phases involved in emergency management; prevention, planning, response and recovery and various elements can run simultaneously and flow into one another (Hull 2011).

2.1.1 First Responders

As part of the planning process, schools resource officers and leaders collaborate with first responder teams to construct a crisis plan to be implemented in emergency scenarios (Aspiranti et al. 2011). First responders are the initial group of people on scene of an emergency and include police, fire and medical personnel (Campbell et al. 2008). Response times can vary depending on location so it is important that teachers are adequately trained in emergency management and possess the skills to cope in changeable circumstances.

Current training methods require teams of first responders to partake in large-scale drills that are complicated to organize and often difficult to carry out (Djordjevich et al. 2008). Exercise drills can take two days to complete involving an array of expert personnel with different backgrounds. The logistics of getting participants together is challenging and excessive costs deter essential training from regularly happening, leaving officials seeking other financially viable approaches (Chen et al. 2008).

A lower cost training solution compared to large-scale drills is the implementation of on-site emergency response and disaster training for staff. Most recently schools in the United States, have been implementing specific lock down and evacuation drills for school shooting events. Emergencies can happen at any time in school, so educational authorities are advised by regulatory bodies to be proactive in their approach to handle crisis situations (Hull 2011).

2.2 Emergencies in Schools

Emergencies on school property are caused by a wide variety of uncontrollable events. For some countries the threat of earthquakes is a priority (Moghadam et al. 2012) while others fear hurricanes, school shootings or the spread of disease (Gainey 2009).

2.2.1 Medical Emergencies

Heads of schools must take swift action against the outbreak of viruses such as the H1N1 (swine flu) to combat the spread of infection or they risk the threat of school closure (Lu et al. 2011). Aside from global pandemics medical emergencies at school can be asthma attacks, cardiac arrests, epilepsy and allergic reactions to food and insect bites. These life-threatening conditions can be fatal if appropriate medical treatment is not delivered immediately (Morris et al. 2011).

2.2.2 Targeted Violence

There are more school shootings in the United States and Germany than any other countries. Other forms of targeted violence include knife attacks and arson which are more common in German schools (Leuschner et al. 2011). The term 'targeted violence' was coined in the Secret Service's 1992 Exceptional Case Study Project (ECSP). Targeted violence is a premeditative incident of violence that can only be prevented through prediction. The high profile attacks at Columbine High School in April 1999 and the Virginia Tech shootings in April 2007 demonstrated the need for effective emergency management planning, as these massacres are examples of where prevention failed (Stone and Spenser 2010a).

2.2.3 Natural and Man Made Disasters

Nowadays disasters are a frequent occurrence as the number of earthquakes, tornados and terrorist attacks increases every year and the threat of nuclear accidents is a growing concern (Gainey 2009). It is standard protocol for schools and colleges to establish fire safety regulations and evacuation procedures (Zhang 2011) as studies have shown there is a direct link between fatalities and evacuation times (Huang and Zhang 2010). However institutions

are not required to provide additional fire safety training courses, where faculty and students would learn life saving fire-fighting techniques (Zhang 2011).

To enhance crisis management programs, one option is to explore the efficacy of game based learning to substitute real world training. The educational value of serious games and their application will be discussed in the next section

2.3 Serious Games and Learning

The increased use of games in society has led to a new genre of game based learning in education. 'Serious Games' is a term used to describe a specific category of games designed for the purpose of 'edutainment', education and entertainment combined. Rejeski and Sawyer (2002) coined the term in their 'Serious Games Initiative' whitepaper, to make a distinction between video games and games that are specifically designed with learning objectives (Riedel and Hauge 2011).

Emerging from the gaming industry, the demand for serious games has grown significantly over the last few years. Technology innovation and the introduction of tablet computers into everyday life, has made it easier to integrate gaming with learning and opened up new opportunities for the education, military and healthcare sectors (Conconi et al. 2008). Emergency response is a field that has long since embraced technology for simulating evacuations and coordinating training drills (Campbell et al. 2008). Serious games offer a cost effective practical solution to simulate real life training drills (Djordjevich et al. 2008) and facilitate contextual learning, which helps trainees have a better understanding of the material presented to them.

Game based interactive learning experiences are created by uniting three important elements; Simulation Elements, Pedagogical Elements and Game Elements (Gibson et al. 2007).

2.3.1 Simulation Elements

The simulated element of game imitates a real world environment and represents a scenario similar to an actual event. Simulations are designed with Non Player Characters (NPCs), which helps to create an authentic atmosphere and portrays the illusion that players seemingly interacting with real people.

Role-Playing with Non-Player Characters (NPCs)

Controlled by computer programs, NPCs help players become immersed in a games' storyline and identify with their virtual surroundings (Gibson et al. 2007). For example, the purpose of disaster medicine in serious games is to teach players exact procedures in casualty triage. Non-player characters represent patients with severe injuries requiring

trainees to administer treatment. The virtual patients respond realistically to tasks performed (Fig.1), allowing players to reflect and evaluate their own performances (Vidani and Chittaro 2009).



Figure 1. Screenshot of emergency medical procedures game (Vidani and Chittaro 2009)

The benefit of non-player characters is the provision of unlimited access to repetitive role-playing especially in single player environments. When groups of people are not available for real-time collaboration, NPCs act as substitutes for training partners and can support sophisticated artificial intelligence (Aldrich 2009b). During a crisis situation critical thinking skills are challenged when a person emotional state becomes unbalanced (Djordjevich et al. 2008). To effectively reproduce these circumstances in a serious game, Artificial Intelligence (AI) is integrated with non-player characters to generate visual and audio human characteristics (Gibson et al. 2007).

To support the development of AI, one method described by Alexandrova (2011) is to capture video footage of subjects and map their gestures to AI characters (Alexandrova et al. 2011). Complex facial and body animations make characters more attractive and appear to have feelings. Djordjevich (2008) research on emotion modeling for NPCs found that characters designed with cognitive human responses heightened the realism of disaster response training experiences (Djordjevich et al. 2008).

Simulating Drills

In a game environment players have no control over animated characters or simulated events and are unaware of what is coming next (Chittaro and Ranon 2009). Virtual training drills immerse individuals in unpredictable conditions and possess an element of surprise, allowing trainees to mentally prepare for small or large-scale crisis events. Unlike real world evacuation drills, staff are not previously briefed and the seriousness of potential dangers can be portrayed (Ribeiro et al. 2012).

Fire drills are the first type of documented emergency plans for schools (Stone and Spenser 2010a) and are the most common type of training provided by commercial and social establishments. Ribeiro's (2012) study of fire evacuation behaviour through serious game play, found that participant's evacuation response times significant decreased when the exercise was repeated (Ribeiro et al. 2012).

However in a live drill people do not get the chance to replay scenarios to make different decisions. Although this may leave a stronger impression on participants because mistakes have drastic consequences, asynchronous training in games with repetitive engagement provides more room for error (Campbell et al. 2008). Mistakes are acceptable in games and failure is encouraged because learning is a process unique to each individual (Gee 2005).

2.3.2 Pedagogical and Game Elements

The most effective educational games are designed with sound pedagogical theories (Aldrich 2009a) and combine the elements of games which make them fun and engaging (Zarraonandia et al. 2012). The basic components that structure a game include storylines, visual environments, non-player characters, rules, goals, challenges and player interaction with objects (Ismailovic et al. 2012). Good games are designed to bring all these elements together to form a learning environment structured on good learning principles (Gee 2005).

Situated Learning

Gee (2003) argues that games by nature are situated learning environments, because words and actions are automatically given meaning in a game environment. Situated learning is a paradigm developed by Lave and Wenger (1991) to describe the theory that contextual environments nurture the learning of real world applications (Lave and Wenger 1991). Situated learning is a natural way of learning domain specific content and associating concepts in a meaningful way. Learning in context makes it easier to remember information because a person can understand the meaning of objects, images and text while performing an activity (Gee 2003).

Games can be constructed to replicate authentic virtual environments that simulate real world domain activities (Gibson et al. 2007). As previously discussed, simulations can incorporate

non-player characters with artificial intelligence to role-play scenarios with participants, immersing them in a storyline. As the learner interacts with their game surroundings, they become situated in the game and conceptualize meanings through embodied experiences (Gee 2003). Players assume a role in a scenario and live through the game, learning practical skills such as procedures for disaster handling (Junjie, Jong et al. 2006).

Sanders (2005) explored the idea of game based situated learning for procedural training in a nuclear research facility. Using a game, first responders could train in a contamination free simulated environment, learn how to handle equipment, become familiarized with the layout of a building and feel comfortable taking risks (Sanders and Lake 2005).

Behaviorism

Games are commonly built with set of tasks for players to complete that result in accumulation of points and prizes. This system is compliant with Skinner's (1954) operant conditioning theory that characterized how learning is shaped by positive and negative reinforcement (Skinner 1954). Players are rewarded for making good decisions while completing tasks and are penalized for bad choices. This motivates players to accomplish goals and progress through the game to subsequent levels.

Experiential Learning

In attempting to further understand the complexity of different learning styles Kolb (1984) established an experiential learning theory consisting of four distinct stages: concrete learning, reflective observation, abstract conceptualization and active experimentation (Kolb 1984). Applied to games, this theory describes how players learn new content, develop problem-solving skills, explore different strategies and reach their goals (Gouveia et al. 2011).

Perceptual learning styles

Game based learning facilitates individual learning styles by providing structured choices where users can select their characters, difficulty levels and problem solving options (Gee 2005). Wayne and Galbraith (1985) suggest there are seven perceptual learning styles that characterize the way individuals learn and absorb information (Wayne and Galbraith 1985).

The following is a review of how these learning styles are facilitated through games with the exception of Olfactory Learners, who learn through a sense of taste or smell.

- **Visual and Aural Learners**

Mayer's (2002) cognitive theory of multimedia learning suggests that people learn through a through a combination of words and pictures (Mayer 2002). Games immerse players in dynamically visual content and support audio through narration by non-player characters.

- **Haptic Learners**

Demonstrations in the form of 2d or 3d animated sequences are often used to show players what to do (Aldrich 2009b). This suits haptic learners who can watch and then practice specific skills using external tactile devices. Movement is tracked in a real world physical space and synchronously simulates a response in a virtual environment (Coles et al. 2011)

- **Print-oriented Learners**

Games are associated with a number of external text based mediums such as manuals, walkthrough guides, magazine reviews, online forums and Blogs. Internally games include written instructions, notes and messages, which help print-oriented learners retain information (Gee 2003). For example, the earthquake disaster game 'Running Tommy' used guiding words to assist sixth graders safely escape a dangerous house with falling debris. Developed by Yi-Shiuan et al (2012), the study implied that participants would be able to recall procedural knowledge if exposed to similar real-life events in the future (Yi-Shiuan et al. 2012).

- **Interactive Learners**

Multi-player games work best for learners who like to participate in small group activities with a strong emphasis on team collaboration. Individuals can evaluate their own performance as a team player, using voice and text chat to communicate with team mates in real-time (Allen et al. 2009).

- **Kinesthetic Learners**

Movement is essential to kinesthetic learners, who learn by doing through moving their body. The Xbox Kinect is an example of game accessory with a motion-tracking sensor, which allows players to interact with games using gestures (Cruz et al. 2012).

2.4 Game Based Teaching

The literature has shown that scholars (Aldrich, 2009; Gee, 2003; Gibson, 2007) believe that some games are educational and facilitate different learning styles, yet they are not widely used by educators for professional development training or teaching. There are new opportunities to integrate gaming principles into structured lessons to take advantage of the benefits of game based learning.

Jackson (2009) derived the term 'game based teaching' from Prensky's research to concentrate on the idea of teaching a digital native generation with games (Jackson 2009). From an early age, today's children engage with technology and grow up learning digital skills from sources other than school. Students learn differently than previous generations but teaching methods have not evolved to meet the needs of digital natives. Prensky (2010)

recommends that games should be utilized more in classrooms, as they are effective teaching tools that motivate students to learn. However not all teachers support game based learning (Prensky 2010).

2.4.1 Encouraging Games in Schools

Recent times have seen a vast improvement in the design and development of serious games, making them challenging, fun and appealing to play. But even with new technology developments, negative attitude and perceptions still exist. The main issue is conveying the message that games are educational and not just for entertainment. Teachers that have only experienced video games as a recreational hobby, may perceive games as a reward for good behavior and not as a valuable teaching tool (Schrader et al. 2006). Another problem is trying to understand how pedagogies exist in a virtual environment and how gaming activities can comply with current curriculum requirements (Ketelhut and Schifter 2011).

Van Eck (2006) proposes encouraging games in school by getting students or teachers to build games themselves or have educators collaborate with developers. Commercial off-the-shelf games (COTS) are an alternative practical solution when serious games are not available, but they do not necessarily have educational content. Teachers are in control of the learning experience and choose a game applicable to the subject matter being taught. This is a creative approach that requires some imagination on the teachers' behalf to structure classroom activities around gaming objectives (Van Eck 2006).

2.4.2 Professional Development Training

There is a growing need for professional development training for teachers so they can understand how to use games in a meaningful way. Some teachers are frustrated with the lack of support from school administration, so they engage in peer learning from colleagues with more knowledge in the area. Prensky (2010) advises teachers to make games an experimental part of each class and to ask students for constant feedback. Experimenting with serious games in an ongoing basis, will benefit educators by positively impacting their perception of games and introduce a new avenue for teaching and learning

2.5 Summary

The reviewed literature has highlighted the importance of emergency management in schools and the growing need for the involvement of teachers. Serious games provide an affordable solution for crisis training and incorporate pedagogical theories making games a viable educational tool for teaching. However there are many issues around introducing game based learning into classrooms, so scholars (Aldrich, 2009; Gee, 2003; Gibson, 2007, Prensky,

2010; Van Eck, 2006) recommend experimentation and professional development training to encourage teaching with games, by playing with games.

Emergency management training through serious games provides educators with an opportunity to experience first hand a virtual environment designed especially for learning. This exposure could change their attitudes and perceptions towards games and encourage the adoption of game based learning. Based on this concept, this research will implement a case study where educators engage with a serious game designed to teach emergency management in a situated virtual learning environment.

3. Design

The literature review established there are potential benefits for using serious games to train educators in disaster handling. This chapter builds on the literature review and describes the development of an educational game specifically designed with school emergency scenarios in mind.

3.1 Description of the Serious Game

A 3D role-playing strategy game was devised that simulated three common school emergency scenarios, one from each category of man-made disasters, medical emergencies and targeted violence. Set in a fictional secondary school, the game story centers on St Savior's, where live training drills are taking place to prepare the school for emergency situations. The player assumes the role of a new teacher "Mr. Peterson" who is asked by "Principal Daily" to take part in the day's events by completing a number of tasks and challenges to help strengthen the schools emergency management plan. The replication of a familiar school environment allows the target audience, educators, to identify with their avatar and situate meaning with objects and surroundings (Gee 2003).

3.1.1 Game Online

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

3.1.2 Game Objective

The game is designed to give educators an introduction to emergency management planning through games with two objectives in mind:

1. Demonstrate the affordances of game based learning technologies as an alternative method for training teachers in emergency management. The virtual environment provides safe locations where teachers can experience simulated crisis scenarios and mentally prepare their reactions in real life events.
2. Showcase the potential of learning games as educational tools by allowing teachers to experience first hand an educational game built upon clear and established pedagogical theories. This positive experience may have an affect on their attitudes towards integrating serious games in their own classroom.

3.2 Pedagogies and Game Levels

Situated learning is the pedagogical foundation that structures all the learning game activities, designed to mirror real life scenarios. Based on an analysis of the learning objectives and the game level content, a decision was made to combine game based situated learning with other pedagogical strategies to enhance learning in a contextual environment.

Each level of the game is constructed along the principles of a distinct pedagogical approach, additional to situated learning (Fig. 2). The next section will describe the rationale for the pedagogies in the design process.

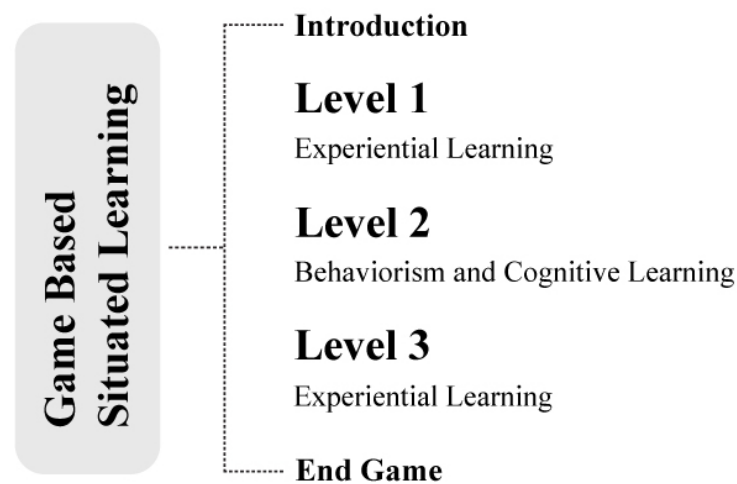


Figure 2. Level design with pedagogies

3.2.1 Situated Learning

Lave and Wenger's situational learning theory (Lave and Wenger 1991) states that people are more likely to absorb information when learning takes place in an environment directly related to the subject matter. In the case of emergency management training, it was decided that a virtual school would be developed, with challenges based on actual emergencies that happen in school. The literature provided ideas for these scenarios, classified into three separate game levels.

1. Game level one, replicates a typical school fire scenario with tasks designed to allow players to associate actions with objects in real time, and situate the meaning of an activity with real world counterparts.
2. The scenario in game level two centers around a medical emergency where a student has an allergic reaction to something they ate and the player must administer an Epi-Pen. The player is immersed in a classroom environment and must learn how to perform tasks mirrored to the real world.

3. Game level three simulates one of the most life threatening emergencies that can happen in school, an active shooter event. History has proven that people have three choices in order to survive: Run, Hide or Fight. Each scenario is based on a real occurrence so learning takes place in a contextual environment.

Specific features were built into the three game levels to heighten the sense of realism, helping the learner relate lessons learned to real world scenarios. Non-Player Characters (NPCs) were used to represent students and staff who interact with the player and respond to his simulated questions. The use of NPCs was critical to portray the illusion of social interaction, an important component of situated learning that helps provide a more authentic context. The game levels included the following features:

- **Timer:** A timer is used to put the player under pressure.
- **Sound:** The atmosphere is intensified by sounds including; alarms, explosions, footsteps, screams, background noise and gunshots.
- **Visuals:** Fire and smoke simulations are used to enhance the fidelity of the environment. Also camera shaking animations help visualise the force of explosions and gunshots.
- **Interaction:** Animated characters use gestures to represent their mood. For example, distressed NPCs cry, wave their arms, shrug their shoulders and shake their heads.

3.2.2 Experiential Learning

When designing tasks for the first and third game levels, Kolb's four stage learning cycle (Kolb 1984), was found to be a complementary match to structure the players learning and bring deeper meaning to the activities.

- **Concrete Learning:** The player learns best practice procedures for fire safety and school shooting events.
- **Reflective Observation:** The player reflects on their actions.
- **Abstract Conceptualization:** The player's problem solving skills are tested.
- **Active Experimentation:** The player explores different strategies and understands the consequences of their actions.

3.2.3 Behaviorism

A feedback and points system were integrated into the game design, to reward the player for good behavior or give negative feedback for not completing a task correctly. This implementation evolved from research into Skinner's operant conditioning theory which states that learning is shaped by positive and negative reinforcement (Skinner 1954).

3.2.4 Cognitive Learning

A drag and drop picture puzzle game was designed for the second game level to test the players memory skills. Playing games can develop cognitive functions such as spatial ability, visual attention, verbal fluency and memory skills. In line with Mayer's (2002) cognitive theory of multimedia learning, the player learns through a combination of words and pictures, constructed upon previous knowledge (Mayer 2002). This theory was also implemented in the fight level of the school shooting scenario, where players watched a video of their task happening in real life, reinforcing their learning.

3.3 Walkthrough Guide

The Thinking Worlds authoring tool software was used to design and build interactive learning experiences in a 3D game. The platform contains a visual drag and drop scene flow editor and automatic game logic programming for interactions with characters and objects. (See Appendix A to view the game logic flowcharts). The next section describes the player's experiences and their tasks performed in the game.

⇒ Introduction

The school is implementing a new emergency management plan and will be running live drills throughout the day with staff and pupils. Greeted by Principal Daily, Mr. Peterson a substitute teacher is briefed on the day's events and learning objectives. Instructions are given on how to interact with objects and characters before the player continues to level one.

⇒ Level 1: Man Made Disasters

Task: Mr. Peterson arrives at the school cafe only to find a microwave has gone on fire and the students don't seem to notice. He has sixty seconds to get all the students out before the fire gets worse. To make the students leave he must approach each group of teenagers and ask them to go outside to their fire assembly point (Fig. 3).

When the students are safe, the player is asked to put out the fire by choosing one of the four fire extinguishers placed on the wall. Information is given on the common types of fires and usable extinguishers to help the player make the best decision (Fig. 4). If the wrong extinguisher is chosen the fire will spread, but if the correct extinguisher is used the fire will turn to smoke (Fig. 5).



Figure 3. Game Level 1: Fire – Screenshot

Consequences to actions are immediate, so the learning is situated and happens in real time with visual results. The player is able to experience in context what happens in an emergency, when they do not pay attention or read labels correctly.



Figure 4 and 5. Game Level 1: Fire Extinguishers – Screenshot

Mr. Peterson is then directed outside to make sure all the students are safe. He is asked to do a head count and must try and remember how many children were in the cafe at the start. Again, attention to detail is tested as the player's environment is connected to an activity. There were seven students but only six came out, so the player is faced with a dilemma; will he wait for the fire brigade to arrive? Or go against protocol and go back inside the burning

room to save the missing girl? (Fig. 6). If he chooses to be a hero, he re-enters the cafe to find the fire is uncontrollable but finds the girl crying in a corner.

As previously discussed, experiential learning structures the tasks for this level. The user learns about evacuating students, putting out a fire with the correct fire extinguisher and then reflects on their actions. In the final task, the player's problem solving skills are tested when they have to count the number of students and decide what to do next. They are given the opportunity to experience a branching story and explore the option of returning to the burning building.

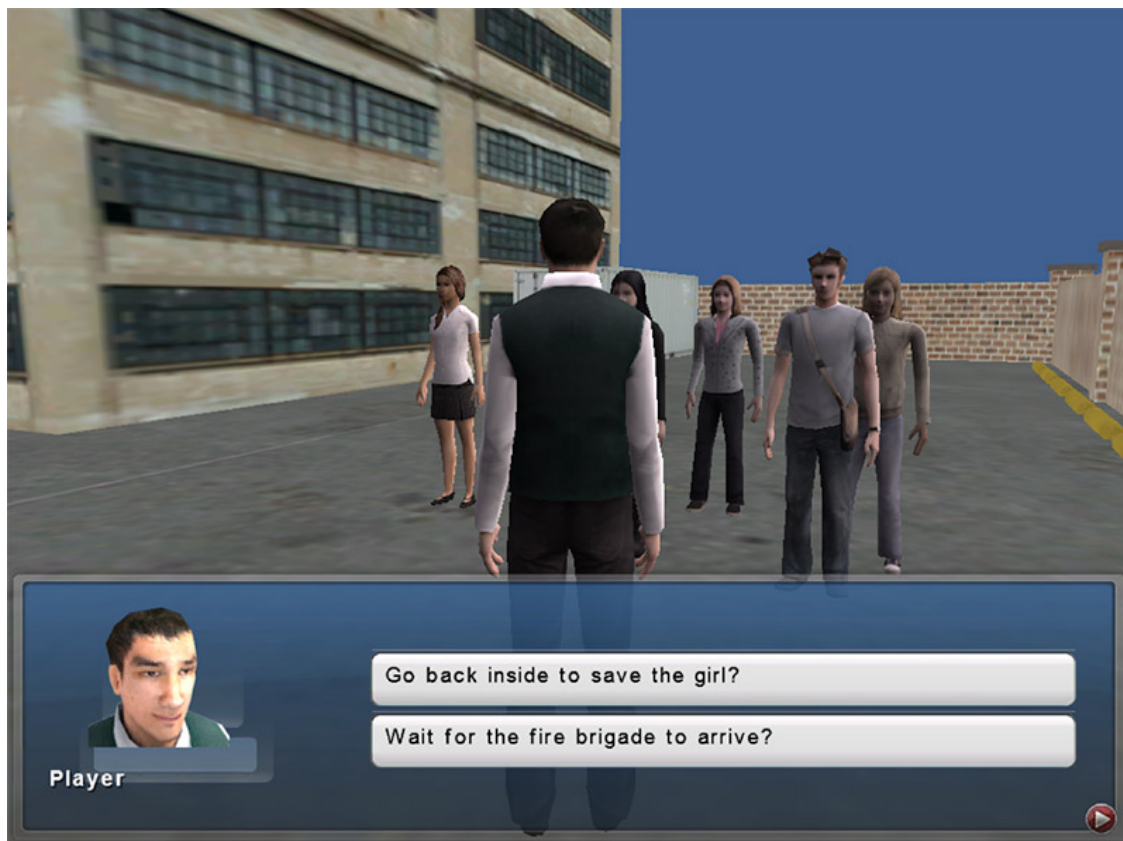


Figure 6. Game Level 1: Outside – Screenshot

Learning Objective: The player will learn procedures, by completing procedural activities in a situated learning environment. During the task, the user will learn how to choose an appropriate fire extinguisher based on the common types of fires that occur. Fire extinguishers are designed to put out specific types of fires such as wood, gasoline, petroleum oil, appliances, cooking oils and grease. Fire safety officials strongly warn against re-entering a burning building once you have escaped. This advice is reinforced when the user is given the choice to find the missing girl or wait for the fire brigade.

⇒ **Level 2: Medical Emergencies**

Task: The school nurse summons Mr. Peterson asking him to supervise a class she has just finished teaching about allergies. Their usual teacher Miss Devlin has just gone on maternity

leave and has left some ice cream presents on the table for the students. The nurse asks Mr. Peterson to give out the ice creams before they melt and warns him about the enthusiastic students who want to share their knowledge. Mr. Peterson heads to the classroom and gives each student a present.

Applying Skinner's behaviorism theory, if the task is executed correctly the player is rewarded with points and positive feedback from the students with vital information required to complete the second task. If the player does not accomplish the challenge, instant negative feedback is received from the characters (Fig. 7).

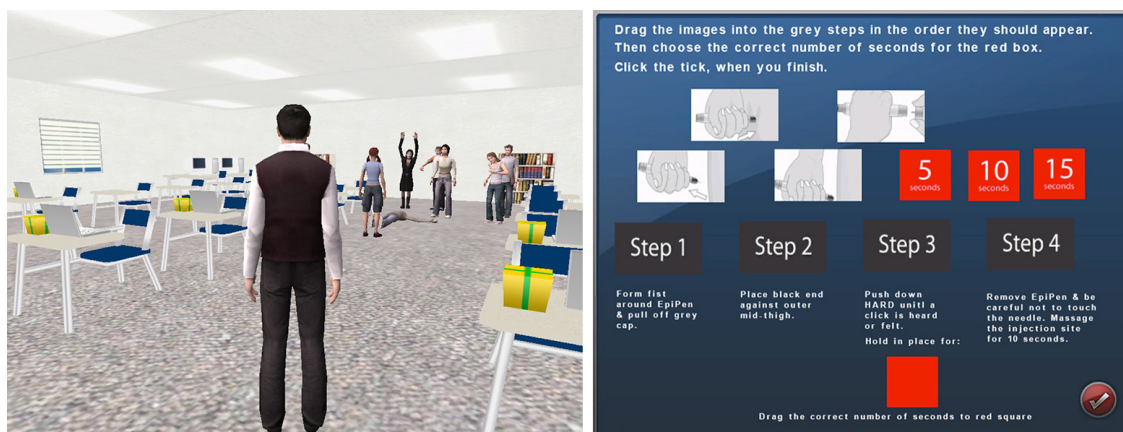


Figure 7 and 8. Game Level 2 – Screenshot

This technique was used to disseminate the information required for the second task in the activity. Instead of displaying slides of static text on screen, the player is given snippets of information as they move around, making the process of absorbing the material interactive. Derived from the situated learning theory, this approach adds substance to the content being learned in an environment familiar to the player.

When all the presents have been given out, one of the students tells the teacher she is not feeling well and then collapses. She had an allergic reaction to nuts that must have been in the ice cream and needs an EpiPen shot that she carries in her bag. In order to do this, the player must complete a puzzle that contains four steps on how to administer a dose of epinephrine. The player drags and drops an image of a step and must choose between 5, 10 & 15 seconds to hold down the EpiPen for when injecting (Fig. 8). The user must recall prior learning in the game to complete the task by arranging the images in the correct order. Cognitive skills are developed through this task by challenging the player's attention span and ability to associate words and pictures.

Learning Objective: The user will learn about food allergies, the symptoms of an allergic reaction and how to treat Anaphylaxis with an injection of epinephrine using an EpiPen.

⇒ Level 3: Targeted Violence

Task: A school shooting is taking place and the school has been locked down. Mr. Peterson arrives in the teachers' lounge as students frantically run towards him under heavy gunfire. Under the best practice guidelines for surviving an active shooter event, the player is given three ways to react to the life-threatening situation (Fig. 9). Aligned with Kolb's experiential learning theory (Kolb 1984), the user must initially choose one option, but is then given the opportunity to experience the other two alternatives and possible outcomes.



Figure 9. Game Level 3: Decisions – Screenshot

1. Run: Can you safely escape?

The game switches to an aerial view and you can see the shooter walking about below. The player must navigate their character safely to the other side of the building without coming too close to the shooter or the results will be fatal (Fig. 10). At the end of the game the player is given some vital information on how to train your mind for these events and be prepared at all times.



Figure 10. Game Level 3: Run – Screenshot

2. Hide: Is there a good place to hide?

The students are upset so the player must hurry to find an unlocked door to a room where they can hide. Once there, the player must decide to turn off the lights and lock the door. The shooter's footsteps can be heard outside as he reloads his gun. The user is given some information on the best practice guidelines for hiding in a safe place (Fig. 11).

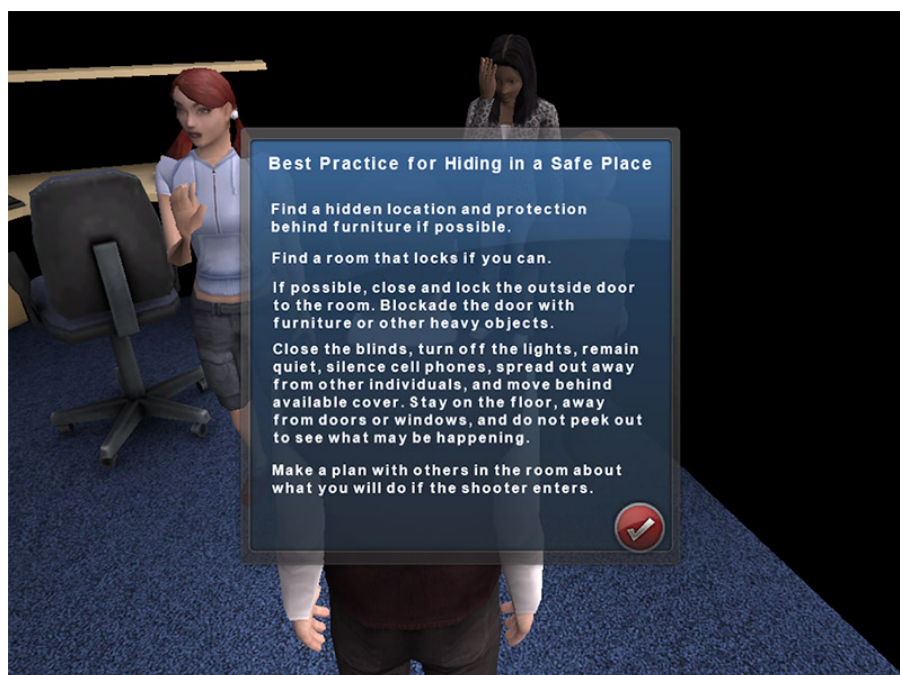


Figure 11. Game Level 3: Hide – Screenshot

3. Fight: Will you take out the shooter?

If you decide to confront the shooter you need a plan so the player goes back to the classroom with the students. The floor of the room is marked with pink spots that represent where each student should stand when the shooter comes through the door. The player must click on a pink spot to move a student into position (Fig. 12). The player receives the message “You picked a bad spot, are you thinking tactically?” when the wrong spot is chosen. This is shown to condition the player to think and make the right choice, aligned with Skinners recommendations in his operant conditioning theory (1954). The player will continue to receive negative messages until they make correct choices.

The students should be positioned to hide behind the door waiting to attack, while students under cover of a table should throw objects to distract the shooter. When this activity is complete the player watches a twenty second video clip of how this tactical approach is reenacted in real life (Fig. 13). Learning is reinforced for players through the use video, inline with Mayer’s (2002) cognitive theory of multimedia.



Figure 12 and 13. Game Level 3: Fight – Screenshot

Learning Objective: The user will learn the best practice guidelines for surviving an active shooter event when faced with three choices: Run, Hide or Fight. In the ‘Run’ scenario the objective is to show the player how dangerous this can be, as a safe escape route is not always visible. The ‘Hide’ scenario teaches the user to turn off the lights, barricade the door, stay quiet and make a plan. The ‘Fight’ scenario demonstrates how a group of trapped students can take down a shooter by working together as a team. Each scenario is based on reality so learning takes place in a situated environment.

⇒ End Game

Principal Daily thanks to Mr. Peterson for completing the day’s training drills. She asks him to write a short reflective passage about his experience and directs him to an online form.

3.4 Summary

The serious game contains three game levels with tasks and activities based on man-made disasters, medical emergencies and targeted violence. Infused with appropriate pedagogical theories for the content on each level, the player is challenged to complete the training and mentally prepare for such disastrous events. The range of subject matter covered throughout the game, highlights the potential game based learning has for other topics in education.

4. Methodology

This chapter establishes the primary and secondary research questions and the methodology used for conducting the research. A detailed description of the data collection tools used is described in section two, followed by an account of the implementation with the chosen participants.

4.1 Research Question

This research study aims to explore how individuals can be trained to deal with emergency situations that happen at school, through game based learning. Part of the research evaluates if the experience of training through games positively influences attitudes and perceptions towards teaching with games. Therefore, the research questions are defined as follows:

Primary Research Question:

- In what ways can game based learning be used in emergency management training for schools?

Secondary Research Question:

- How can game based training encourage the use of games as a teaching methodology?

4.2 Research Methodology

A case study was chosen as the appropriate method for investigating this research study after considering the structure of the research questions and the context of the subject matter. Yin (1994), defines case studies as being a suitable method for answering “how” or “why” research questions (Yin 1994) that relate to a complex social phenomenon within a real world context (Yin 1994).

4.2.1 Advantages

The case study is a bounded system where a limited number of participants will engage in one activity, playing an educational game specifically designed to simulate emergency scenarios. The benefit of this approach is that an in-depth investigation of the subject material can be examined from a variety of data sets (Creswell 2011). A detailed analysis of participants’ personal views on the topic of emergency management training and games as teaching tools can be explored, and triangulation of the data will help form a better understanding of the issues.

4.2.2 Disadvantages

The disadvantage of using a case study is the research may be subject to bias. Results from one data set can unintentionally influence another if more attention is given to a particular topic or the researcher focuses too much on a specific outcome. Another issue is the quality of the results as insufficient data may be produced, contributing to unsuitable or unusable results (Creswell 2011). Also, compared to statistical research the results cannot be generalized to a larger population, because any generalizations are only theoretical (Yin 1994).

4.2.3 Exploratory versus Explanatory

An exploratory case study approach was selected for this research study because answers to the problem have yet to be defined. The first research question asks '*In what ways can game based learning be used in emergency management training for schools?*'. Although the literature has given guidance on game based learning for emergency management training, how it can be used effectively for schools requires further exploration. If an explanatory method were chosen, the research would be focused on explaining why game based learning should be used in emergency management and not how. Understanding the nature of game based learning and explaining the relationship to training would become the focal point of the research and not identifying potential uses of the technology.

In order to address the second research question '*How can game based training encourage the use of games as a teaching methodology?*', participants' personal views on the topic of teaching with games requires exploration. An exploratory approach is necessary here as the results are dependent on the success or failure of the case study game activity and have issues still to be discovered.

Other research methods such as action research were examined for suitability. The study is not trying to solve an educational problem, but merely put forward ideas for an alternative method of training. Therefore action research was not appropriate, as the individuals involved in the study won't directly benefit from the results.

4.2.4 Quantitative and Qualitative Research

Quantitative research is used when numeric data needs to be collected from a large number of people for a statistical analysis. Typically, respondents are asked a number of preset questions and choose responses from a set of predefined answers or statements. This method allows researchers to analyze trends, compare groups and explain relationships between variables. Due to type of research questions presented, quantitative research will be effective at establishing participants' backgrounds and general views towards game based learning and emergency management training.

Qualitative Research will allow for a more detailed understanding of the subject matter and exploration of the current problems. This approach is good for collecting data based on participant's perceptions and investigating the correlation of trends evolving from the research. However, researcher's bias can influence these results, as the data is not numerical. The "how" and "why" natures of the research questions require a qualitative analysis to explore in-depth participants' opinions.

4.2.5 Data Collection Methods

Both qualitative and quantitative data collection methods are used in this study. The data is triangulated to look for instances of themes and relationships within the data.

Quantitative Research: Surveys are used to analyze trends in the data and establish and individuals overall inclination to respond to certain types of questions.

Qualitative Research: Qualitative research through open-ended questions & interviews will enable the research questions to be investigated further and provide an in-depth look at the problem. Issues may arise that are not covered in the literature review and themes can develop from discussions with a small number of individuals.

4.2.6 Data Collection Tools

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

1) Pre-knowledge questionnaire

Before playing the 3D game, participants were asked to complete a pre questionnaire to assess their prior experience with video games for both entertainment and training purposes. In addition, a Likert scale was included to measure participants' opinions on learning games before playing the game. Likert scales were first developed by Rensis Likert in 1932 and use a five-point scale, ranging from strongly agree to strongly disagree (Likert 1932).

2) Game Play Report

At the end of the learning game participants were asked to reflect on their learning experience and fill in a game report in the form of an open-ended questionnaire. The questions referred to each game level and the decisions made in each scenario. Participants reflected on their choices by writing a short passage, providing an in-depth look at their actions and mind set. An open-ended question facilitates qualitative research and gives participants an opportunity to candidly express their ideas.

3) Post questionnaire

The post questionnaire contained three questions evaluating if participant's views had changed after playing the learning game. The first and second question sets were designed using the Likert scale method requiring participants to agree or disagree with statements about learning games and technology integration in schools. The last question was concerned with self-efficacy, constructed using a scale devised by Albert Bandura (2006). The questions were formatted using the phrase 'can do' as 'can' represents a belief in one's ability to accomplish something (Bandura 2006). Participants rated their degree of confidence in carrying out tasks regarding game based learning in school.

4) Semi Structured interview

One-to-one interviews were conducted with a number of participants to discuss topics based on the game and questionnaires. Participants could elaborate on their answers and contribute new insight by reflecting on their experience. Interviews are a good method of qualitative research, allowing participants to communicate their way of thinking in a coherent manner (Creswell 2011). The interviews were semi structured as participants were guided by specific questions, but allowed to talk about areas most important to them. Data from the participants report influenced the questions asked in the interviews, so participants could elaborate on themes that occurred to get a deeper understanding of the issues.

4.3 Implementation of the Research

4.3.1 Research Participants

Convenience sampling was used to recruit participants from the first & second year Masters class in Technology and Learning at Trinity College Dublin. Other participants were sourced from schools associated with the researcher's workplace, an e-learning company named H2 Learning. There were thirty-two participants in the study composed of teachers and individuals working in education with an interest in educational technology. The pre questionnaire determined that the participants had little or no experience playing video games but were open to the possibility of game based learning for educational purposes.

All data sets produced will be treated as a whole and not separated into teachers and non-teachers. The type of data produced reflects theoretical opinions and personal experiences with the learning game. Only six participants are not teachers, but their views on emergency management in schools and teaching with games are just as relevant as they are interested in educational technology. However, the implication for having participants with an interest in teaching with technology is that the results may become biased. The researcher recognizes this as a possibility and will acknowledge this predisposition in the findings.

4.3.2 Researcher Bias

The researcher is a classmate of the participants in the second year M.Sc. in Technology and Learning, and an employee of the eLearning company where some of the participants were sourced. 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. Due to the nature of the study, participants were pre warned in information and consent sheets, that some users may find the study stressful or upsetting. Persons with a history of mental or psychiatric problems were advised not to participate in this study. (See Appendix B for detailed documents).

4.3.4 Procedure

The study was designed to be delivered online without interference from the researcher and took place over a two-week period from January 25th to February 8th 2013. Participants were emailed a link to a website that had clearly labeled instructions on how to complete the tasks (Fig. 14). This involved filling out a pre questionnaire, downloading and installing a serious game on a PC, completing a game report and finally submitting a post questionnaire.

Participants from the second year Masters class in Technology and Learning completed the study in a classroom setting, and all other participants completed the study individually at home.

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 the 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 seven participants agreed to take part in one-to-one audio-recorded semi structured interviews.

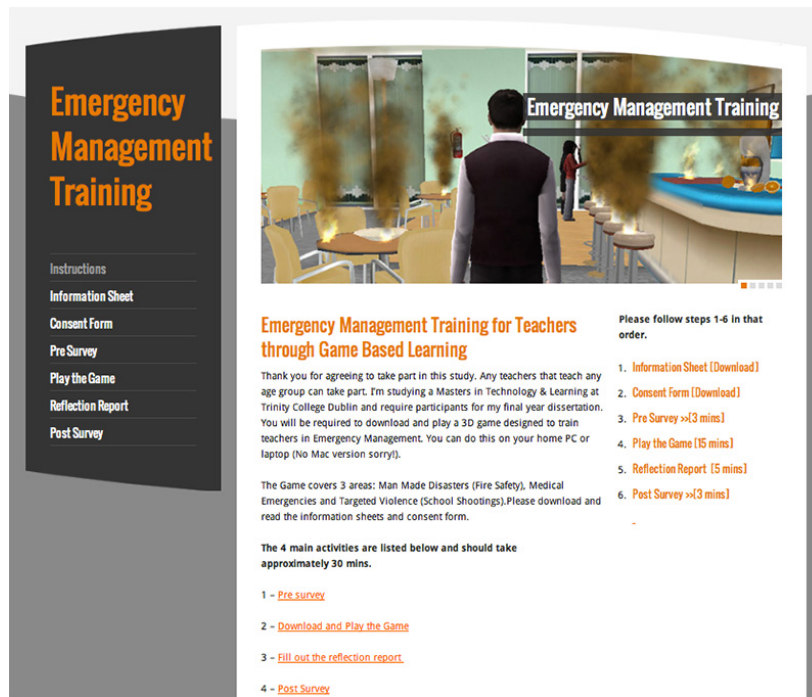


Figure 14. Research study website with Instructions.

4.4 Summary

The research study was successfully implemented and both qualitative and quantitative data was collected through questionnaires and interviews. The methodology applied to this exploratory case study provided an abundance of information to answer the research questions. The next chapter will present the data analysis and discuss the findings in great detail.

5. Data Analysis & Findings

Data from multiple sources including questionnaires, reports and interviews, were collected during the implementation of the case study and an examination of this material was undertaken. This chapter relates the findings of this investigation to the primary and secondary research questions and looks in-depth at the results.

5.1 Data Preparation

There were four sets of data collected including pre and post questionnaires, participants' reports and semi structured interviews (Table 1). Data from the questionnaires was collated in a spreadsheet to facilitate a comprehensive analysis. The participants' reports contained six open-ended questions that described each user's personal experience and views. The answers to each question set were individually coded and a thematic analysis of the results was created. The interviews were transcribed from audio-recordings and subsequently coded with meaningful descriptors that were grouped together, forming four higher order themes.

Data Collection Tool	Participants	Quantity
Pre Questionnaire	32	7 Questions
Participants' Report	32	6 Open Ended Questions
Post Questionnaire	32	3 Questions
Interview	7	95 Minutes (7 Interviews total length)

Table1. Data Collection

5.2 Pre Questionnaire

The pre questionnaire was designed to establish the participants' professional backgrounds and prior experience of playing video games. The questions also evaluated attitudes towards emergency management training to understand any preconceptions held.

5.2.1 Background Information

There were a total of thirty-two participants who completed the pre questionnaire, of whom twenty-six were teachers, principals or a lecturer. Participants taught students ranging in age from four year olds to adult learners, in schools and colleges across Ireland. The other six participants worked in the field of information technology or in the education sector.

To gauge participants' prior gaming experience, questions were asked about their online gaming habits. The results showed that 90.6% of participants' never play videos games and the other 9.4% played games for an average of one hour a week. When asked '*Have you*

ever played a computer game (3D or 2D) for the purpose of training/learning?' 80.6% responded 'No'.

Examining previous emergency management training, 71.4% of participants said they had completed both fire safety and first aid training. Two participants had more extensive training in cardiopulmonary resuscitation (CPR) and how to use a defibrillator. With regard to use of games, 43.6% '*strongly agreed*' or '*agreed*' they had no idea how games can be used for emergency management training and 15.6% were '*undecided*'. The majority of respondents, 59.4% were also undecided if emergency training should be done face to face. In relation to game based learning, 71.9% of participants said they would like to see more learning games being used in schools and 93.8% '*disagreed*' or '*strongly disagreed*' with the statement that games are not educational.

5.2.2 Key Finding

The results of the pre questionnaire showed that participants had little or no experience with gaming for either educational or entertainment purposes. However, the sample groups of participants have an interest in educational technology and were positively disposed to the idea of game based learning in schools. Some participants had previous experience of real life emergency management training in the form of fire safety and first aid training, but were unsure how crisis training could be implemented through games.

5.3 Participants' Report

The purpose of the participants' report was to gather data on player activities and tasks carried out. After completing the game, participants' reflected on their choices and were given the opportunity to further expand their thoughts about each game level, through the report. An analysis of the data identified the occurrence of three prominent themes that captured the essence of the participants' experiences (See Appendix C).

5.3.1 Procedural Learning in a Contextual Environment

Reacting in a crisis situation requires a person to instinctively make quick decisions, as there is no time to think. The first game level about fire safety tried to simulate circumstances that would test an individual's ability to react. Players engaged in tasks, each designed around specific procedures for fire safety. For example, players were given information on different types of fire extinguishers. Immediately afterwards, they were asked to recall the material by choosing the correct fire extinguisher. However, 37.5% chose incorrectly with many participants commenting they did not read the instructions carefully enough (Table 2). In a real life fire scenario, there is no time to read labels so prior learning about correct procedures is crucial.

Games provide the ability for players to repeat exercises and learn procedures in a contextual environment, which puts things in perspective. One participant commented '*It is an interesting way to learn about safety procedures. Definitely would remember this better than by reading it*'. Another said it was '*good practice of real fire procedures*' and the game was '*Interactive and should be remembered more than a static presentation*'.

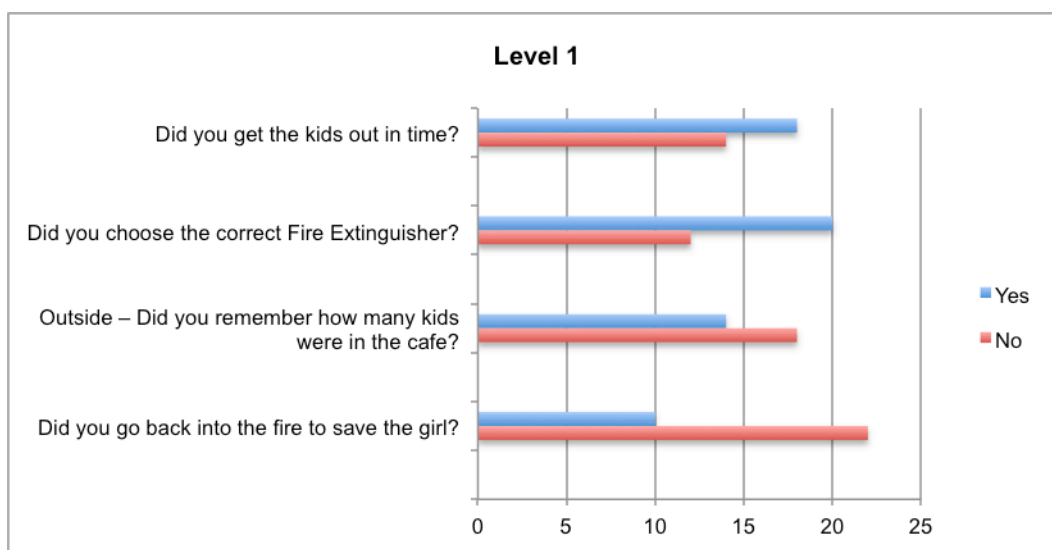


Table 2: Level 1 Responses

The next stage of the game mirrored another real life scenario requiring participants to recall how many students were originally inside the fire area. Only 43.75% were able to remember the correct number of students. One participant said '*When there is chaos it is difficult to be calm. Counting the children was not in my mind*'. In last game activity of the fire scenario, players were told a student was missing and given the opportunity to find her. Even though it was only a game, 68.75% chose not to return to the burning building and follow standard protocol, showing that players were immersed in their surrounding and obeyed the same guidelines as in reality.

Similar to the first level, the second level medical emergency scenario required players to recall facts presented to them by students. Several participants commented they did not pay enough attention and the screaming onlookers made it difficult to concentrate. This was evident in the results of the puzzle game where 62.5% completed it incorrectly (Table 3). Overall participants enjoyed the learning experience, one participant said '*The information was disseminated in an interesting way*', and another said it was '*a good way to stress the importance of knowing what to do in an unexpected situation*'.

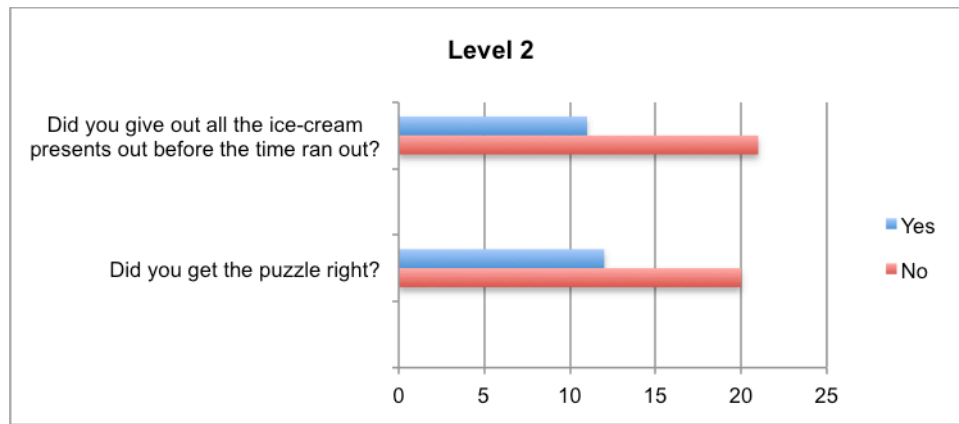


Table 3: Level 2 Responses

5.3.2 Emotional Learning

A person's emotions play a critical role in their decision making process, but learning how to react under pressure is no easy task. The third level school shooting scenario, simulated an environment that deliberately immersed players in anarchy and mayhem, while trying to teach them best practice procedures for crisis management. Participants' emotions were heightened and several comments included the words; *'petrifying'*, *'stressed'*, *'surprised'* *'panic'* *'under pressure'*, *'scary'* and *'anxious'*.

The game allowed participants to face an impossible situation and experience three known options for survival; *'Run'*, *'Hide'* or *'Fight'*. However, when the first choice was made, participants were unaware they would be given the opportunity to test others, so that decision is a reflection on their initial reaction to a school shooting emergency. The results showed that 43.74% chose to run, 50% chose to hide and surprisingly 6.25% chose to fight (Table 4).

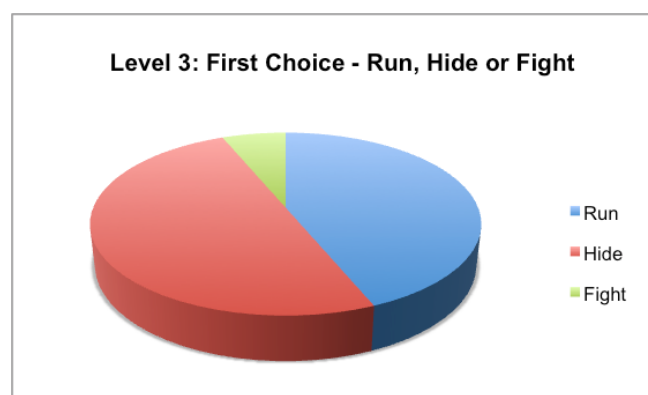


Table 4: Level 3 First Choices

Run: The majority of participants said they felt scared and under pressure in the run level. The time count down made them feel uneasy and although most players got shot, participants were eager to try again. One participant said *'I was killed three times by the shooter'* and

another said *'This was the best stage, I replayed it'*. This shows emotional experiences can motivate users to learn even when the context is distressing.

Hide: In the hide scenario comments from participants describe how they felt *'trapped'* but hiding seemed liked the safest option. One participant said *'I think the door being locked was a very good touch, to invoke panic and immerse the user in the exercise'*.

Fight: Facing the shooter was not a popular first choice because participants were unaware it was a viable option. They were *'surprised'* with this task as it forced them to think about a fighting strategy without weapons, so students could take down a gunman. One participant suggested developing the level to encourage people to think about the set-up of their own classroom in a similar situation.

5.3.3 Learning Through Play

The pre survey analysis revealed that although participants were inexperienced gamers they were fully supportive of game based learning in schools. This was evident in the unanimous response 'Yes' when asked *'Has this experience with games encouraged you to teach with games?'* in the final question to the participants' report. Learning about games by playing games, was a popular reason given for this verification. This partly answers the secondary research question *'How can game based training encourage the use of games as a teaching methodology?'*.

One participant said *'It has shown me that games may be used to create a realistic emergency situation and could be used in conjunction with role-playing in the classroom. I would be willing to improve my knowledge of education through gaming, in order to reach a broader spectrum of students'*. Other participants commented that games could be useful as a revision activity, but there were concerns raised about having good quality instructional content in games, particularly when targeted at children.

5.3.4 Key Finding

The finding showed that games are an effective platform for procedural learning when learning takes place in a contextual environment. Games facilitate repetitive training, essential for practicing safety protocols and decision-making. Additionally, the game invoked an abundance of emotions, which had an effect on participants' choices and actions. Emotional learning is fundamental in crisis training because knowing the correct procedures does not always equate to making the right decisions, especially in a distracting chaotic environment. These findings address the first research question *'In what ways can game based learning be used in emergency management training for schools?'*.

Furthermore, participants had a positive experience of the learning game, which had an effect on their attitude towards emergency management training through games and the concept of teaching with games.

5.4 Post Questionnaire

There were three questions in the post questionnaire containing a number of statements that participants were asked to identify with, in order to assess a change in attitudes towards game based emergency management training and the conception of games as teaching tools.

5.4.1 Learning Games

Table 5 depicts a Likert scale of survey responses from participants who agreed or disagreed with a number of statements about learning games. The results compared with the pre questionnaire showed participants were more aware of the possibilities for emergency management training through games, after playing the serious game. 93.8% agreed they got a good sense of how games can be used to train emergency management personnel, and 90.6% agreed that *'games are a good way to teach emergency management'*. When asked if they felt better prepared to deal with a crisis at school, 81.3% *'agreed'* or *'strongly agree'* they were. All the participants agreed that emergency management training is beneficial to teachers and 90.6% said they would recommend it.

Overall participants agreed with the statement *'I can think of many ways I could use games in my classroom now because of my experience with this game'*, with only 28.1% either *'undecided'* or *'disagreed'*, showing the game had a positive effect on participants views.

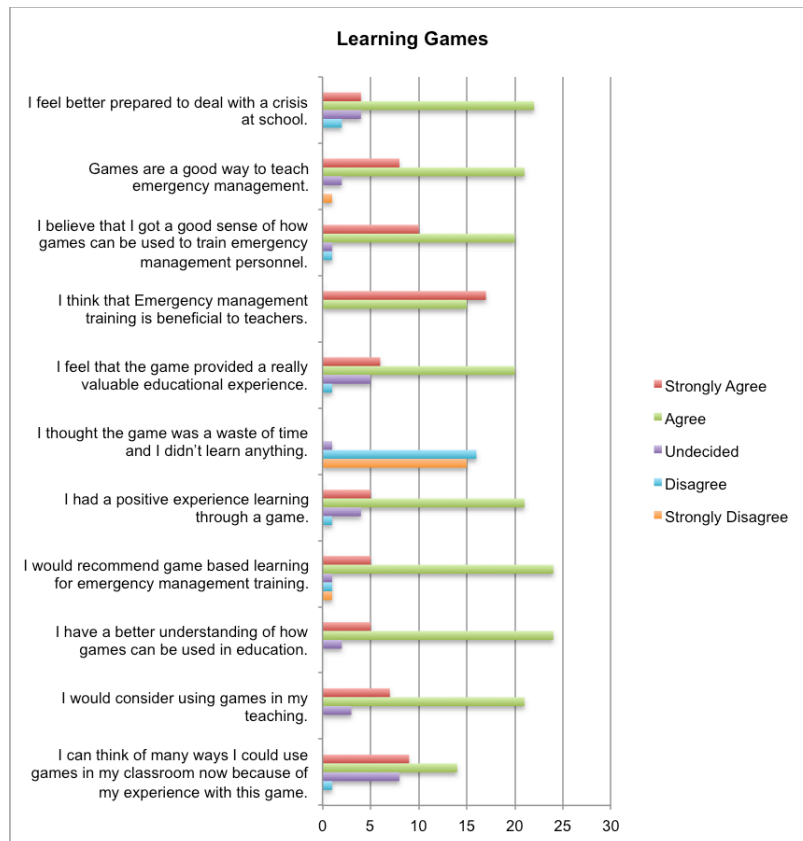


Table 5: Learning Games - Post Questionnaire

5.4.2 Integration issues

On the topic of integration, the second question set referred to statements (Table 6) about the adoption of game based learning. The participants were asked their opinion on why they think learning games are not widely adopted by teachers. There was overall agreement that the reasons learning games are not widely adopted is because of the lack of resources, both financial and technical as well as the need for professional development training. These findings support Prensky (2010) and Gee's (2003) recommendations for teacher training to encourage the use of games in schools.

Interestingly 50% of participants 'agreed' or 'strongly agreed' with the statement '*I think teachers are concerned that games will be a distraction from learning*' and 40% of participants were undecided if teachers believed that games were not educational. The perception that games are just an entertaining hobby, is an issue that came through in the literature review (Schrader et al. 2006). However, even entertainment focused commercial games can be used for education. Unfortunately inexperience with games can lead to ignorance about the potential uses of alternative game types (Van Eck 2006). This was seen in the finding where 9.7% of participants disagreed with the statement '*I think there are not enough relevant and good quality learning games on the market to use*'. Participants are inexperienced gamers, which could be the reason for this result.

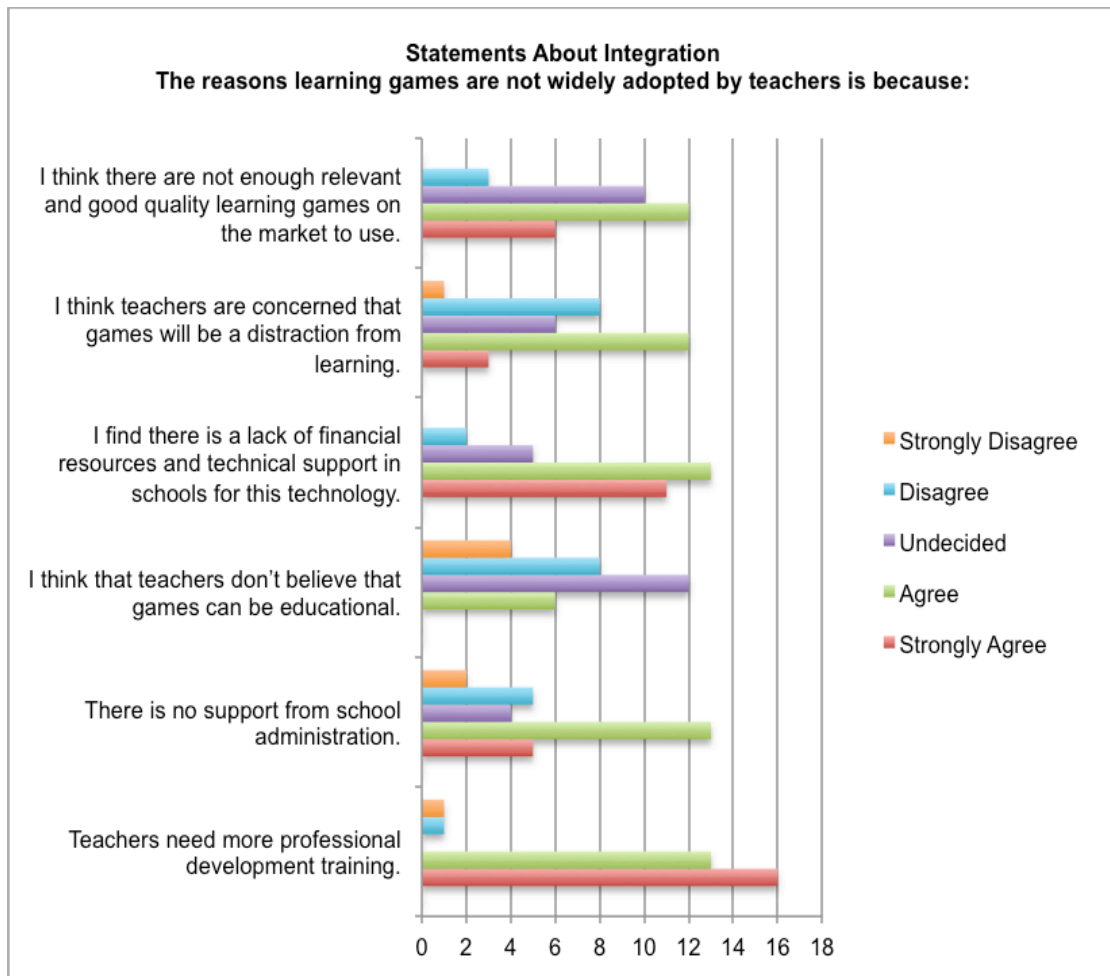


Table 6: Post Questionnaire

5.4.3 Confidence

The last question set (Table 7) was designed to examine participants' confidence in their ability to perform tasks with games. Although participants were inexperienced gamers, there were highly confident they could integrate learning games into lesson plans and help other teacher learn about game based learning. This result could be attributed to the participants' interest in technology and learning and is inline with the pre survey results stating that participants would like to see more learning games being used in schools.

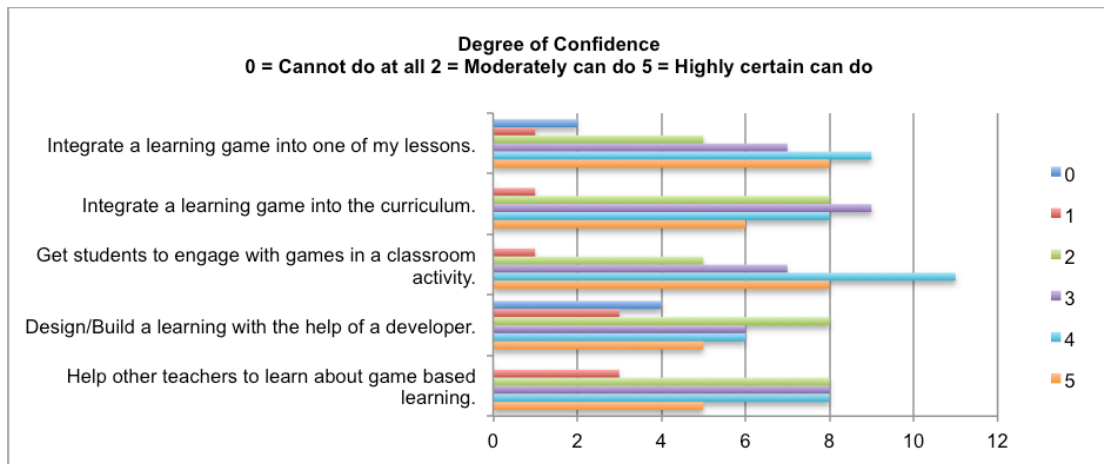


Table 7: Degree of Confidence Statements

5.4.4 Key Findings

The post questionnaire partly answered the secondary research question '*How can game based training encourage the use of games as a teaching methodology?*'. Playing the game helped raise awareness of the potential benefits of game based learning for schools, and the experience had a positive effect on participants' perceptions of emergency management training through games. The findings also implied that regularly playing games increases one's knowledge of good educational games available on the market. Other key findings disclosed that some teachers think other educators would find games a classroom distraction and may not be convinced about their educational contribution. However participants were confident in their own ability to use games as teaching tools.

5.5 Interviews

An analysis of the responses in the participants' report, provided guidance for the questions asked during the interview process. Prominent themes that emerged from the data sets were used as pointers to create discussion topics. This semi-structured format allowed participants to expand further on important issues and elaborate on specific areas in more depth.

Transcripts of the interviews were coded with descriptive labels (Fig. 15) and analyzed for the prominence of themes (See example in Appendix D). This resulted in four themes representative of the participants' opinions.

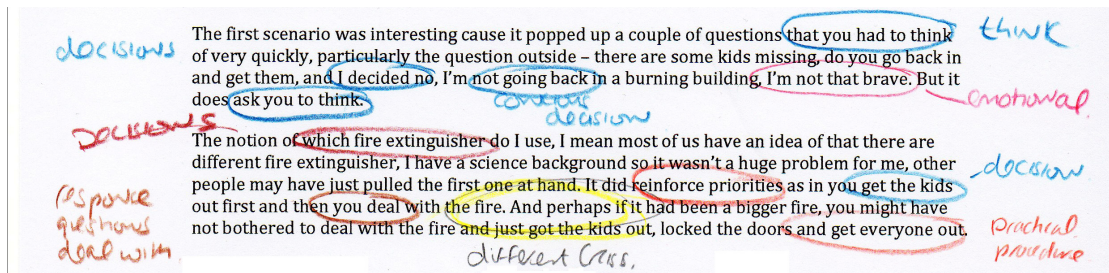


Figure 15. Interview Coding Example.

5.5.1 Decision Making

Each of the participants interviewed approximately once week after playing the game, spoke about how vivid the game was still in their mind. The school shooting scenario had the greatest impact because it was topical and allowed the experience of a situation otherwise deemed implausible. This was especially true in the 'Fight' scenario, where participants learn where best to place students only to be surprised by the final outcome. The stress and emotional strain felt by participants heighten their experience imprinting a learning journey they would never forget. There were no wrong answers in this level; it was simply about choices and strategies. Participants said *'you get a chance to see what you would do in that situation'* and *'you can see that your actions have consequences'*.

While only three scenarios were designed for the game, participants could visualize other potential uses for emergency training at school, such as dealing with an aggressive parent or a medical emergency involving a child choking on a sweet. The *'what would you do?'* thought process is valid in any crisis and training through games can help individuals make rational decisions.

5.5.2 Experiential Learning

When interviewed participants were asked if they would make different choices if they played the game again. There was variation in the responses, with some expressing how they would have tried to save the girl in the fire scenario and others reflecting on their first choices in the active shooter event. A suggestion was made to improve the game by showing the correct procedures after the player made a bad decision, or adding prompts to help users know why their actions were incorrect. In line with the participants report findings in the example of the 'Run' scenario where players could repeat the task, participants talked about repeating the game to learn from mistakes. One participant said *'If you can repeat that till you get it right, it would help you remember'*, another said *'I failed everything, I burned the school, I got shot, It was the stress, but I would do it again.'*

5.5.3 Immersion

Participants spoke about how immersed they felt in an atmosphere intensified by sounds of real world noises. Emotional tensions were amplified with loud noises of fire alarms, screams and gunshots caused players to be distracted and stressed. One participant said '*I knew it was a game, but it still made me feel frightened*'. Participants felt under pressure and took the game seriously as they were engrossed in their surroundings and captivated with the challenges.

5.5.4 Exposure To Technology

The topic of exposure to technology frequently occurred in participants' interviews. Similar to the findings in the participants' report, there was agreement that if educators were exposed to gaming, it would encourage experimentation with the medium itself. Commenting on this topic, one participant said that when left to teach naturally, people tend to teach the way they were taught themselves. In order to break this cycle, professional development is required to expose teachers to new technology such as gaming. If people are taught with games, they are more likely to teach with games. Another participant talked about seeing the benefits of games, '*I would see more positives than negatives. If I'm taught with games, I might use them in my classroom*'. However, participants pointed out that games should be part of a blended learning curriculum and there are ongoing issues to deal with regarding technology availability and financial support.

5.5.5 Key Findings

Games support strategizing and role-playing potential outcomes in crisis situations. Individuals can mentally prepare for unimaginable emergency scenarios, by repeating choices and replaying scenes over again, until they are comfortable with their emotional state. The addition of sound and interactive elements enhances realism to immerse players in the seriousness of a disaster. These results address the first research question '*In what ways can game based learning be used in emergency management training for schools?*'. Additionally, training can be applied to wide number of scenarios such as arguments with parents, knife attacks or choking children.

Playing game simulations for emergencies at school can influence educators' perceptions about game based learning. Increased exposure to technology through mandatory training or professional development can impact the adoption of gaming technology for teaching and learning. Experimentation provides the opportunity for teachers to endorse games, after they experience first hand their learning potential and educational value. These findings answer the secondary research question '*How can game based training encourage the use of games as a teaching methodology?*'.

5.6 Unexpected Results

There were limitations of the ThinkingWorlds game software, which affected user experience while playing the game. Participants were frustrated their avatar was too slow and many had great difficulty navigating their character around the screen. However, instructions were given to instigate a run animation by press 'Shift'. Because the individuals participating in the study were predominately inexperienced with game formats and game controls, an always on-screen accessible instructions menu should have been integrated and prompts to help inexperienced users would have been beneficial.

Other issues arose in the school shooting level. Some participants' felt this training was unrealistic for Irish teachers, but part of the training was to acknowledge that you could never say 'it will never happen to me'. When interviewed, one participant pointed out that '*Dunblane happened in Scotland*', referring to the school shooting massacre in 1996. The school shooting level was designed to put users in control of their choices, therefore it was not mandatory to complete each scenario. Because the nature of the topic was sensitive and emotions were heightened, the option was given to stop anytime you felt uncomfortable or if you had enough. Unfortunately this reasoning meant that not everyone experienced each choice, because they were not forced to do it. In hindsight, it should have been compulsory because part of the learning experience was lost without completing the three scenarios.

5.7 Summary

Each data set from the case study resulted in key findings that explored and answered the research questions. The implications of these findings will be discussed in the final chapter, along with the limitations of the research and suggestions for further developments.

6. Discussions and Conclusions

The main objective of this research study was to explore how emergency management training for schools could be implemented through game based learning, involving real life situated learning scenarios. Training through games provides educators with an opportunity to experiment with a new medium; therefore attitudes and perceptions towards teaching with games was part of the research investigation. This chapter will examine the findings of the data analysis and their corresponding meaning applied to the research questions.

6.1 Emergency Management Training Through Games

The literature has shown the significant need for emergency management in schools to prepare staff for any eventuality, taking place in school grounds. Researchers (Campbell et al. 2008; Chen et al. 2008; Djordjevich et al. 2008; Ribeiro, 2012; Vidani and Chittaro, 2009) are exploring the use of serious games to help support first responders and individuals deal with crisis situations.

The primary research question for this study asked '*In what ways can game based learning be used in emergency management training for schools?*'. The answer to this research question is that contextual, procedural, experiential and emotional learning, are the most prominent ways that educational games can be used to train for emergencies that happen in schools. These findings were disclosed through the research study and will be discussed further below.

6.1.1 Situated Learning

This research study reproduced three common school emergency scenarios, based on the literature review, resulting in the creation of a 3D gaming environment designed specifically for emergency management training. The first fire safety level emphasized the effectiveness of procedural learning in contextual surroundings. The graphics gave participants a visual image to associate with real world procedures that helped them remember specific content in a meaningful way.

For example when the wrong fire extinguisher was chosen, the consequences were immediate as sound and animations accentuated mistakes. This concept supported by Gee (2003), demonstrates that learning in games with meaningful objects, has a greater impact on the users ability to absorb information than reading static information in books or presentations.

Cognitive skills were tested at the end of the fire level, when participants tried to remember the number of students in the café. Unaware this would be asked, the task required paying particular attention to detail, a skill essential in a real life emergency. The medical emergency

level again tested cognitive abilities and many participants failed this task, because they did not take in the information given by the students, resulting in the puzzle becoming a process of elimination. Participants commented the failure of this task was because the noise was distracting and the virtual students divulged too many facts and figures. But their comments reinforce the success of replicating an atmosphere similar to a real life classroom. Emergencies are stressful and full of distractions, therefore it is essential to replicate that type of atmosphere in an emergency training game. However, for inexperienced gamers instructions and prompts should have been clearer in the overall game design and correct answers or procedures shown to players at the end of each level.

The 'Fight' level in the school shooting scenario incorporated Lave and Wenger's (1991) situated learning theory, exhibiting how contextual learning creates an impressionable experience. Combined with real life video footage that reinforced the learning, participants found this task most astonishing. Making them complete an activity to place students around the room, before watching the video ensured they would become self aware of their mistakes and choices. Had this exercise been repeated through a presentation or read in a book, the impact would not have been the same because users could actively experiment in the game. This type of learning helps to develop problem-solving skills and explore alternative strategies aligned with Kolb's (1984) experiential learning theory (Kolb 1984).

6.1.2 Crisis Decision Making

One of the benefits of serious games is the affordance to teach challenging subject matters such as emotional intelligence and crisis decision-making. Learning how to control your emotions in a crisis, is a skill based on real life experience gained through practice and training. By mirroring real world scenarios, games give individuals the chance to play out disaster situations and role-play themselves in unanticipated circumstances.

The school shooting activities simulated a hectic crisis situation and projected participants into the mindset of a teacher faced with impossible choices. Taking a deeper look at their own shortcomings in terms of bravery or emotional readiness, participants examined their decision making process under immense stress and anxiety. According to Gee (2003), through mistakes and failure, users are able to learn without dealing with real world repercussions. (Gee 2003). Participants embraced the ability to make choices and found the experience an exhilarating memorable learning experience. Evident in the participants' reports and interview responses, the ability to repeat game levels is vital to evaluate one's actions and choices to unexpected events. Responses to real life tragedy can never be foretold, but training and preparation can help individuals deal with sensitive issues. Users should repeatedly play disaster-training games until they are comfortable with their level of procedural knowledge and decision-making skills.

The relevance of the school shooting level came into question because Ireland is not a location where these events commonly take place. However, school shootings are a major problem globally and a subject that must be covered in any emergency management plan for schools.

The findings of the research study answered the primary research question, showing that serious games are effective for emergency management when they facilitate procedural training in a contextual environment, and support the exploration of emotional learning.

6.2 Teaching with Games

The secondary research question '*How can game based training encourage the use of games as a teaching methodology?*' was addressed by exploring participants' attitudes and perceptions before and after playing the learning game. Participants were slightly biased towards game based learning because of their backgrounds and exhibited a desire to teach with games in their responses to questions. Nevertheless, with no gaming experience, the majority of participants had difficulties mastering the game controls and understanding typical game instructions. This highlights the need for professional development training, in the area of games, which of course could further extend to other technologies.

Experimentation is essential for the development of gaming skills and teachers need confidence to direct a lesson integrated with learning games. To teach with games, first one must have an understanding of how to play games. Scholars (Prensky, 2010; Van Eck 2006; Aldrich, 2009; Gee, 2003; Gibson, 2007) are in agreement that experimenting with the medium is beneficial to educators, helping them to realize the full potential of games for learning. One option to encourage experimentation is for educators to take mandatory training courses through games. When teachers are put in the position of learners the efficacy of game-based learning is demonstrated. Emergency management could be used for professional development about games, as it is a relevant subject matter that teachers need to know.

Game based learning has been widely accepted and endorsed by prominent educators (Gee, 2003, Prensky, 2010). Teachers need less convincing about the benefits of games for students, but still require substantial evidence that learning theories are adhered to (Ketelhut and Schifter 2011). Playing an educationally designed game can show teachers how pedagogical theories transfer to game activities and tasks, teaching users while they play.

While the idea of training with games is aspirational, obvious considerations have to be made for the practicality of implementing game based training for teachers. Even with highly trained and enthused educators, the lack of technology resources in schools because of funding could inhibit the integration of games into the curriculum. During interviews, participants' said school resources were a major obstacle, so until this problem is solved, many teachers will undoubtedly struggle.

The research has shown that participants were encouraged to teach with games after a positive experience with the emergency management training game. Therefore, the answer to the secondary research question is that game based training encourages the use of games as a teaching methodology, by allowing educators to experience first hand the benefits of game based learning and experiment with educational game play. However, funding and the shortage of technology resources are ongoing problems that still need to be resolved.

6.3 Limitations of Research

Emergency management covers a wide area of topics with potentially hundreds of scenarios that could be created. For this case study, the researcher in the allocated time frame could only build three potential scenarios. The game would have been vastly improved if users had more freedom to explore additional role-playing activities and extra features such as scores, prompts and menus built into the game. Designing and programming games is a time consuming task that involves a team of full time working professionals. A longer learning experience of two hours was preferable, but time and budget were uncontrollable factors. Access to participants is another limitation of this research. A larger number of participants would have resulted in the production of a more comprehensive case study.

6.4 Future Research

The results of this research have highlighted a number of different possibilities for extending the study further. Changing the types of disaster games used in the study along with different participant groups geographically dispersed, are potential options for the future.

6.4.1 Types of Games

Regarding the design of the game based learning experience, commercial games built for disaster training could be used instead, as budgeting and timing was a previous limitation. There are possibilities to share research and collaborate with companies who have already invested time and funding into game creation. Another idea is to create separate games designed for each category of disasters. For example, school violence could be a standalone game or man-made disasters that include hurricanes, floods and fire. Other topics could be investigated in the area of leadership, to teach users how to manage emergency personnel and learn practical organizational skills.

6.4.2 Participants

Sample participant groups could be broadened to include training students for emergencies at school and professional fire, police and medical emergency personnel. Case studies could be location specific with emergencies based on the country of origins' history of troubles.

6.4.3 Teaching With Games

Further research could be carried out with participants to follow up if their experience with games had any effect on their teaching methods. For example, six months after the research study was complete, participants could be interviewed and asked to fill out surveys to measure the real impact of the initial study. It would be interesting to discover if the emergency management training had any effect on their school life and confidence in teaching with games.

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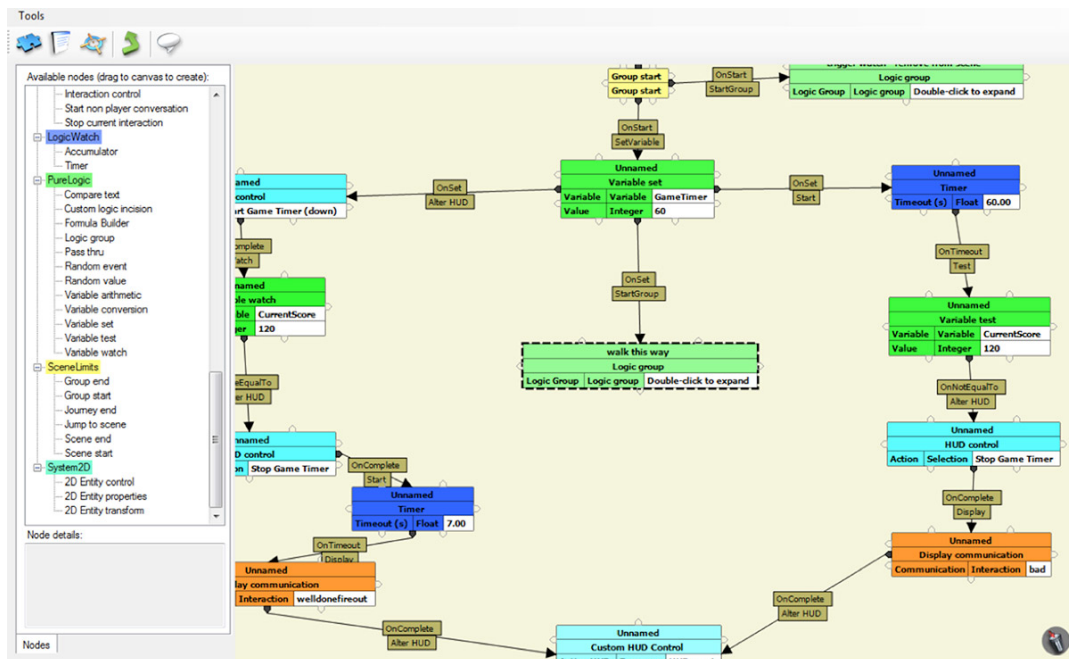
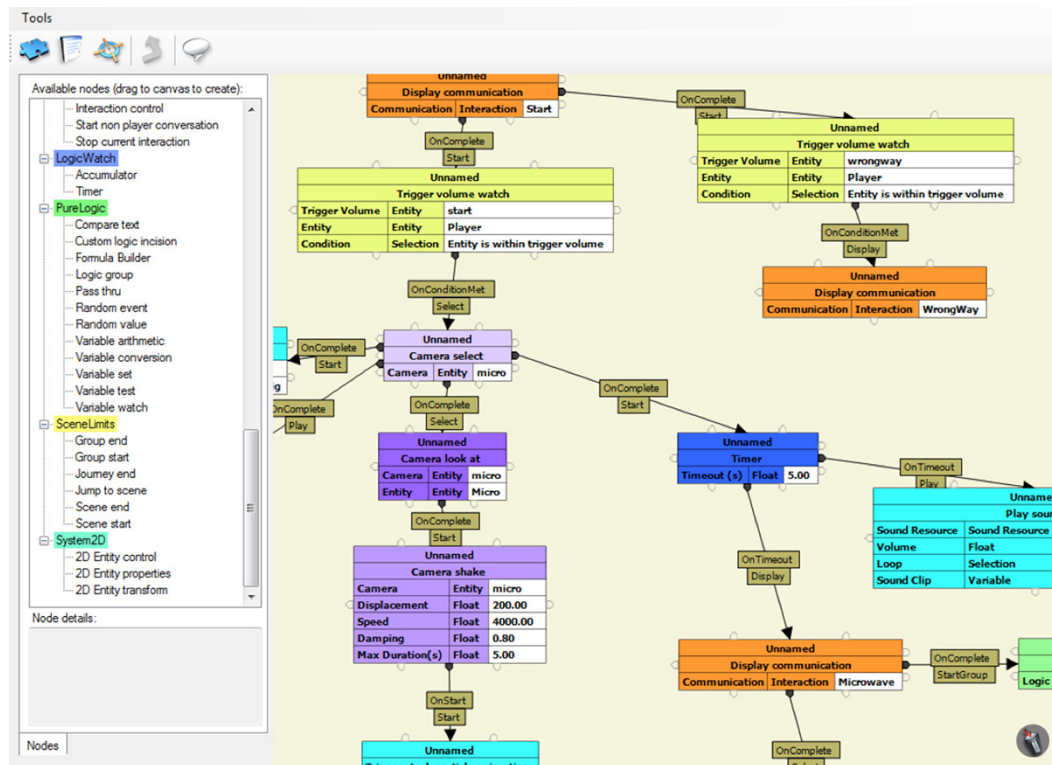
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Appendices

Appendix A: Level 2 Game Logic



Appendix B: Ethics

TRINITY COLLEGE DUBLIN INFORMATION SHEET FOR PARTICIPANTS

Project Title:

Emergency Management Training for Schools through Game Based Situated Learning

Introduction

Emergencies on school property are caused by a wide variety of uncontrollable events. For some countries the threat of earthquakes is a priority while others fear hurricanes, school shootings or the spread of disease. In preparation for the unpredictable, many schools now develop an emergency management plan in anticipation of crisis events. First responders are the initial group of people on scene including police, fire and medical personnel, but response times can vary depending on location. For this reason it is important that teachers are adequately trained in emergency management and possess the skills to cope in changeable circumstances.

Emergency management training through serious games provides educators with an opportunity to experience first hand a virtual environment designed especially for learning. 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. These immersive learning environments are ideal training grounds for developing skills and learning procedures for disaster handling. This study aims to explore teacher training for emergency management through serious games and investigate teacher's attitudes and perceptions towards using game based learning in classrooms.

Learning activities

During this study you will be asked to play an online learning game that will be accessible through a learning management system website. You will be given a username and password to login and will be presented with instructions on how to play the game. You will be required to install the Adobe Shockwave Plug-In in your web browser which is freely available online. You will be assigned a random username and password to access the game, your identity will be never be revealed.

Please find below a table with the activities, a short description and the estimated time per activity:

Name	Description	Time in minutes
Pre Questionnaire	You will fill in an online questionnaire before playing the game.	5 mins
Login and Plug-In Installation	The Adobe Shockwave Plug-In must be installed to run the game.	10 mins
Game Play	You will be represented by an avatar that will interact with characters on screen and objects by clicking on them.	30-40 mins
Post Questionnaire	You will fill in an online questionnaire regarding your experience	5 mins
Interview	Opportunity to discuss your experience	30 mins

	with other educators.	
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Your Participation

This study involves playing a game that some users may find stressful, disturbing or upsetting. The intent is to educate persons in emergency situations so will therefore involve creating stressful scenarios. You should not participate in this study if have any history of mental or psychiatric problems. If you think you might be vulnerable to stress or mental health issues, you should NOT participate in this study.

Your participation is completely voluntary and you are not compelled to volunteer by virtue of pressure from interpersonal relationships or professional's 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.

It is anticipated that during the activity you will experience a new game based learning 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 an employee of H2 Learning and a classmate of some of the participants in the Second Year Technology & Learning MSc. 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

**TRINITY COLLEGE DUBLIN
INFORMED CONSENT FORM**

LEAD RESEARCHER: Samantha Kotey

BACKGROUND OF RESEARCH:

Emergencies on school property are caused by a wide variety of uncontrollable events. For some countries the threat of earthquakes is a priority while others fear hurricanes, school shootings or the spread of disease. In preparation for the unpredictable, many schools now develop an emergency management plan in anticipation of crisis events. First responders are the initial group of people on scene including police, fire and medical personnel, but response times can vary depending on location. For this reason it is important that teachers are adequately trained in emergency management and possess the skills to cope in changeable circumstances.

Emergency management training through serious games provides educators with an opportunity to experience first hand a virtual environment designed especially for learning. 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. These immersive learning environments are ideal training grounds for developing skills and learning procedures for disaster handling. This study aims to explore teacher training for emergency management through serious games and investigate teacher's attitudes and perceptions towards using game based learning in classrooms.

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 the Adobe Shockwave Plug-In in your web browser which is freely available online. Further technical instructions will be sent out to you regarding the game installation. Your 3D activity and game scores will be tracked and logged for the purpose of this study.

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.

Your Participation

This study involves playing a game that some users may find stressful, disturbing or upsetting. The intent is to educate persons in emergency situations so will therefore involve creating virtual stressful scenarios. You should not participate in this study if have any history of mental or psychiatric problems. If you think you might be vulnerable to stress or mental health issues, you should NOT participate in this study.

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.

It is anticipated that during the activity you will experience a new game based learning technology for teaching and learning in schools.

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.

Conflict of Interest

The researcher is an employee of H2 Learning and a classmate of some of the participants in the Second Year Technology & Learning MSc. The data collected during this study will not be used against you in any way.

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:

Questions for Pre Online Questionnaire

Pre Questionnaire: <http://www.surveymonkey.com/s/B79F9NQ>

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?

Teacher
Principal
Lecturer
Other _____

2. What age group do you teach?

3. Where is your School/College located?

4. On average, how often would you play video games?

Never
1 hr a week
2 hrs a week
5hrs a week
More than 5hrs a week

5. Have you ever played a computer game (3D or 2D) for the purpose of training/learning?

Yes
No

6. What training have you ever done for emergency management at school?

Fire Safety
First Aid
Other _____

7. Say to what extent you agree with following statements:

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
I have no idea how games can be used for emergency management training					
I think emergency training should be done face to face					
I have never used game based learning in my classroom					

I would like to use game based learning in my classroom					
I don't know how to use games in my lesson plans.					
Games are not educational					
I would like to see more learning games being used in schools					

Questions for Post Online – Questionnaire

Post Questionnaire: <http://www.surveymonkey.com/s/BVBRVN6>

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:

1. Learning Games	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
I feel better prepared to deal with a crisis at school.					
Games are a good way to teach emergency management.					
I believe that I got a good sense of how games can be used to train emergency management personnel.					
I think that Emergency management training is beneficial to teachers.					
It is important that the game be fun to play in order for it to be a valuable educational experience.					
I thought that the game was not too challenging and difficult to use.					
I feel that the game provided a really valuable educational experience.					
I had a lot of fun playing the game.					
I thought the game was a waste of time and I didn't learn anything					
The uncertainty of the game made me feel uncomfortable.					
I had a positive experience learning through a game.					
I would recommend game based learning for emergency management training.					
I have a better idea of how games can be used for training					
I have a better understanding of how games can be used in education.					
I would consider using games in my teaching.					
I can think of many ways I could use games in my classroom					

2. Integration

The reasons learning games are not widely adopted by teachers is because:	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
Teachers need more professional development training					
There is no support from school administration					
I find there is a lack of financial resources and technical support in schools for this technology.					
I think that teachers don't believe that games can be educational.					
I find there is a lack of financial resources and technical support in schools for this technology.					
I think teachers are concerned that games will be a distraction from learning					
I think there are not enough relevant and good quality learning games on the market to use.					

2. Rate your degree of confidence by recording a number from 0 to 5 using the scale given below:

	0 Cannot do at all	1	2	3 Moderately can do	4	5 Highly certain can do
Integrate a learning game into one of my lessons.						
Integrate a learning game into the curriculum.						
Get students to engage with games in a classroom activity						
Design/Build a learning with the help of a developer						
Help other teachers to learn about game based learning						

Appendix C: Game Report Coding

FIRE

This level was based on Fire Safety. Write a short reflective passage about your thoughts.

I did not know about the different fire extinguishers and that would be something that would inhibit action in an emergency situation. It is important that we that are actions are instinctive, that we know what to do as there will be no time to decide. I also think i would have gone for the fire extinguisher first, and shouted 1 at the students afterwards, but it makes sense to limit potential casualties

2 very realistic
I got so immersed that I jumped a mile when the microwave exploded! Very good, but I should have paid 3 more attention.

4 Couldnt remember the students!
5 Was the exit marked? I could not see it

6 Lot of noise - hard to concentrate\n\nEverything going fast - I will look at this agin
I would have been better if I had used games more - navigation took a little time to get used to. Very 7 interactive and should be remembered more than a static presentation

Too much time spent on getting people out, more time would be good on extinguisher training and fire 8 blankets

I liked the choice of three fire extinguishers.\n\nThe avatar moves very slowly though and this is frustrating. 9\n\nIt takes a long time to move from one group to another.

Was interesting to react to a realistic scenario.\n\nBug on group of three students, girl got caught in chair and 10 i had to restart

Good information and there was a sense of adrenaline and having to focus and make a decision however, I 11 did click on the CO2 extinguisher but it chose the foam for me!!

getting the kids out on time was hard as i didnt realise they were all kids, also trying to remember the keys 12 to use and where the door was!

13 i didnt pay enough attention to the instructions. i was too anxious to get going with the experience

14 Interesting information on fire extinguishers and need to read instructions carefully

I have no previous Fire Safety or Evacuation Procedures training. I found myself in situations I have never 15 been in before. I would not know what to do in those situations and may panic, \nI do not work in a school

16 and realise the requirement for this type of training.

I meant to choose the correct extinguisher, so I should have done better there. I would have tried to 17 extinguish the fire first and then moved the kids out.

18 Good practice of real fire procedures

19 I thought it was good to point out that running back into the school isn't always the safest option.

I've had online fire safety training in the form of a click-through multimedia presentation. This 20 experience was definitely created a real sense of urgency and forced me to think quickly and decisions

19 which are probably closer to those I would make in real life. I think this was definitely more effective.

It is an interesting way to learn about safety procedures. Definately would remember better than only by 21 reading it.

22 Needed to remember the Extinguisher

22 It was good that the idea of not going back in was reinforced as people often forget that.

23 When there is chaos it is difficult to be calm. Counting the children was not in my mind.

24 I was stressed out with the sound.

Good way to learn how you might react in an emergency. Perhaps slightly different as to what you may do 25 in a real situation but definitely food for thought.\n\nGood training on how to react in an emergency for

26 school children. Good work.

26 instructions unclear and couldnt move person fast enough

27 Yes

28 Good Training, and good to point out the different types of extinguishers for different types of fires.

After getting the kids out and choosing the correct fire extinguisher a message appeared saying that the fire 29 would now go out. When asked would I return to find the missing student, I did so based on the fact that the fire was extinguished. I think you need to make that call based on the severity of the fire and the

30 location of the pupil.

30 Well done all essential elements were there

31 It was a helpful activity. Fire drills in primary schools involve getting 300 pupils out fast.

The text said it was an electrical fire, yet the graphics showed it was a cooker - with pots on top - that was 32 actually on fire.

Handwritten Notes:

- Realistic** (next to line 2)
- Immersed** (next to line 2)
- Sound** (next to line 6)
- React** (next to line 9)
- Realistic** (next to line 9)
- Adrenaline** (next to line 11)
- Emotional** (next to line 11)
- Reason** (next to line 15)
- Procedures** (next to line 15)
- Realistic** (next to line 19)
- Emotional** (next to line 22)
- Good Training** (next to line 28)
- Good Information** (next to line 30)
- Pay attention** (next to line 13)
- Emotion** (next to line 13)
- Navigation** (next to line 9)
- Decision** (next to line 11)
- Effective** (next to line 19)
- Reactions** (next to line 28)
- Important to be careful** (next to line 31)

Appendix D: Interview Coding Example

Interview D

Some people were being a bit melodramatic in terms of their reaction to the game, in terms of this is awful. From an Irish content, people may not have considered that in a classroom, but if you were in a different country. *Location Based* *CONFUSING* *Fakefaked CRISIS* *What happened*

One of the general comments was that giving the ice cream out to each of the students and getting the information back from each of them, there was too much coming at them. But at the same time that might be the reality that you get piece of snippet of information as your walking down the corridor or something and you have to try and internalize that and deal with it. *deal*

Very few people had played games, so they had navigation difficulties for that age group. *Navigation Problems*

Aside from technical stuff -

The first scenario was interesting cause it popped up a couple of questions that you had to think of very quickly, particularly the question outside - there are some kids missing, do you go back in and get them, and I decided no, I'm not going back in a burning building, I'm not that brave. But it does ask you to think. *think* *decision* *choice*

The notion of which fire extinguisher do I use, I mean most of us have an idea of that there are different fire extinguisher, I have a science background so it wasn't a huge problem for me, other people may have just pulled the first one at hand. It did reinforce priorities as in you get the kids out first and then you deal with the fire. And perhaps if it had been a bigger fire, you might have not bothered to deal with the fire and just got the kids out, locked the doors and get everyone out. *decision* *Practical procedure*

Second Scenario

Being a deputy principal, it wouldn't be the first time that I saw one of the pens. Nearly every year, some kid would bring one in and its left in a central medicine cabinet, and you think I hope to god I never have to use this. The first aiders on a first aid course would get training for it, but after that the parents would just say, this is how we've been told to use the pen and from my point of view what I need to check is, are you OK if one of our staff jabs a pen into your sons thigh, through this trousers. Child protection and all those sorts of issues, just making sure the parents give us consent. All boys school. The other training is if the pens expire, the first aiders try and practice on an orange. Practice and training to get the feel of it. (use haptics). *different CRISIS* *Bigger fire* *Practical knowledge* *Practical procedure*

School Shooting

I would never in a million years thought that attacking the attacker was a strategy, but talking to people afterwards, it's a very clear strategy in the states, you do something to attack the attacker. I didn't do level three. *strategy* *options*

Run like hell - first choice. Hide was second choice. He has already shot me when I was trying to run, so I thought I'd have no chance when I try and fight. *Throwing new strategy* *Realism*

Sound -

The sound was very realistic and I think the sound in conjunction with the time element. Even though in some places the time element was quite subtle, you have to give the ice-cream out before it all melts. But it did cause a little bit of pressure, was a bit of a distraction in a room with people and no one wearing headphones, but if you were doing it with headphones, that would block out more ambient sounds and concentrate on what's happening. The gunfire was quite realistic, the fire alarms and that sort of thing, we do fire drills here on a regular basis, I'd be the last one walking through the school, when that alarm is ringing, because of the intensity of the sound, you can be disorientated at times. *Not prepared, no prior knowledge* *time pressure* *distracted* *solitude* *required* *Not collaborative* *disorientated*

Are games a good way to train people in EM?

I think it is, none of them can say it'll never happen to me. From an Irish audience I think people would say the shooting was a little bit too far, but that can always be substituted by an aggressive parent coming in or if there's an emergency situation that you have to deal with. It's great for people to sit down and do, even if it only makes them think how would I react in this situation.

Do you think if teachers play with games it will encourage them to teach more with games

I think it would, if someone was left to teach naturally, they tend to teach the way they were taught themselves. You can take that extension a bit further, if they see the benefit of the games by being taught through games, they may then go and say, god this is an engaging way of getting the message across, I might try that in my classroom. So I would see more positives than negatives in terms of if I'm taught with games, I'm might use them in my classroom.

Obstacles

I think the first thing any of them would say if time. In terms of a packed curriculum, they need to be comfortable with their teaching in order to try something new. They will always claim and they are probably right that the technology is not fantastic. They would have to take if you wanted a one and one, take the kids down to the computer lab. Some schools are introducing tablets and that sort of thing. I'm a great believer in technology, but I've yet to see a great implementation of tablets. An ebook on a tablet if no good.

The problem is access to the technology, unless these are available on.

Games are a really good way of using tablets, far superior than using textbooks on tablets, or even using smartphones, give it 3-5 years of over coming a technology problem. Currently if you want to use it you have to book the lab and take the kids down there.

You didn't like it when you went through it. People weren't expecting the shooting scenario, we were all expecting the fire one, when we heard about em situations. But suddenly you were face to face with the shooting one and it made you think what would I do in this situation. I think that thinking would stay with you, I certainly won't forget that Dunblane wasn't in the States either, it was Scotland.

There is nothing to stop the weirdo coming off the street or a past pupil with a grudge - knife attacks, sometimes you deal with very uncertain people in education, so these are the sorts of things you need to consider.

Realistic

Ideas for scenarios

Experiment exposure experiential

technology issues

Access

Memorable experience

possibility

Seems far fetched

React?

Caught in a trap

engaging

Positive experience

Access issues: Hassle Not easy

Future technology good way to learn

Surprise

Location

Realistic could happen

Ideas scenarios

Knowledge Learning