Research and Development of a Digital Game Based Learning Framework for Education: Designing for Educators and Students

by

Sherry F O'Sullivan

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This thesis is dedicated to my daughter Jennifer Ellen O'Sullivan.

Abstract

Research has shown that gamers are motivated and engaged when playing games, however the design and development of educational games often misses the mark in capturing the essence of what actually motivates and engages the player. The studies have concentrated either on the content and pedagogy from the educational perspective or on players from the game design perspective. Researchers often state “videogames engage and motivate players” as the reason for using Serious Games, giving examples of commercial entertainment games as a starting point to their arguments.

This thesis covers two main aims. To situate the terminology that exists within the domain of educational games and to research, design and develop an educational game that is suitable for both educators and students. It aims to understand the needs of both sides.
It investigates, what motivates gamers and formulates a framework that could satisfy both needs.

An initial focus group was started to initiate the study involving students as designers over a ten month period, followed by a survey. During this time, 2 prototypes were developed which culminated in the design and development of the final prototype.

The final prototype was built around a conceptual framework taking into account what student gamers expect in a game (fun and challenging game play) and what educators expect (Game for purpose) and was subject to a Phenomenographical study.

This thesis therefore examines the expectations and perceptions of both educators and students with a view to designing and developing a game framework that is suitable for both parties and asks “*Can we design and develop a Game-Based learning environment that satisfies the needs of both educators and students?”*

Publications

Part of the initial research into the collaborative design study and mapping of RPG was presented at the proceedings of the iGBL Symposium in 2012. The presentation included a video of the prototype 2 game and received the best student presentation.

Designing Educational Games using the RPG Genre: Student-Gamer Involvement and RPG Affordances. O'Sullivan, S. F., Price, C.B. (2012). In Proceedings of Second Irish Symposium on Game-Based Learning (iGBL). Waterford Institute of Technology, Ireland; 7-8 June 2012.

Clarification of Terms

Serious Game

A serious game is a video game designed for purposes other than just pure entertainment. Not generally liked as a name in the industry, (even by serious games designers), but as Bogost says its *"rhetorical purpose"* is to sell it to those in power and those that shy away from the name "games" and its connotations; it makes it a more palatable and acceptable medium.

Educational Serious Games

Serious Games is an umbrella term for games that are used for education, training etc. Educational Serious Games use the elements of a videogame to educate; their purpose is more than pure entertainment

Digital Game Based Learning

Though often confused with pure Serious Games; Digital Game Based Learning is the use of technology that can be used to entertain but used for education. The difference between the two is that Serious Games (as a purist follower of the term), uses videogame resources and technology to emulate real videogames that are as near to commercial off the shelf video games that are played by hard core gamers. Digital Games can be anything from a quiz such as a flash based game to a casual game type genre.

Game Based Learning

Anything that uses concepts of games/ludology. For instance, using Monopoly to teach Systems Analysis is Game Based Learning.

Videogames

Video Games are computer controlled games, commonly played either on PC or Console platforms and can be 3d or 2d. These can be casual simple games or complex hard core games. They can be single or multiplayer. But as players

usually mean triple AAA games (Complex); these are usually set in 3d environment and are the ones most people mean when they say videogames.

COTS Games

These are Commercial Off The Shelf games; used in education. Examples of this are using Guitar Hero to learn about music or Civilisation to learn about history.

Entertainment Games

Any type of games that entertain and not necessarily digital.

Edutainment Games

Games that were made to educate with game elements hooked on or games that were meant to entertain with education elements hooked on. Serious Games is a new term to get away from the failure of these types of games that were primarily drill type games.

Purpose-Shifting games

Using a game for another purpose than what it was designed for. A term coined by Djaouti (2011). This basically is using COTS games for education etc.

Simulations

Realistic interpretation of real world; an attempt to imitate real world event. This can be 3d virtual world but the term could also be used outside technology/computer based simulations. This type of application (not a game) is most effective for simulating either business processes or to show physics experiments. Is also useful for driving/flying types of simulation for training; in a way these types of “games” that used a virtual 3d environment were used long before the serious game scene.

Sims

A franchise of games under the name The Sims; designed by Will Wright and simulates a virtual life. SimCity simulates building of a city and Sims simulates the virtual life. There are many Sim types for instance SimAnt, SimFarm etc; the aim of these is to control the environment as a whole. Whereas the sims type games is about controlling individual lives (to eat, to socialise, build, etc.).

Games for Change

Games that deal with social/political issues. They are considered as social impact games that educate.

Persuasive Games

Same as above. It is associated with designer and academic Ian Bogost. These come in any form or platform.

Virtual Worlds

A 3d environment. The term can be used for environments that are used for games or not. Second life is a virtual world where people can explore and meet other people but it is not a game. It is just the environment in a simulated world. It can also be used to suggest multiplayer online games. A game can contain a virtual world or be set in it but not all virtual worlds are games.

Gamification

It uses some elements of a game, usually aspects such as leader boards, points and badges. It is not a full game. It is an attempt to gamify business, education etc. In actual fact we have been using gamification for a long time in education, giving out stars/badges for achievements, using quizzes and leaderboards for competitions. It is not well received in the industry (serious games and games), it pretends to be something it is not. Though the term was coined in 2010, most games especially in education have been gamified, so to speak. (nothing wrong with it, just that it can't do what they say it does (engage and motivate), because the true essence of gameplay has been removed).

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Part I: Introduction

1. RESEARCH OBJECTIVES

The 2008 Byron Review, stated that “video games and new technologies” are seen to have an “enormous potential to have a positive impact on children” and there was a need to “focus on the nuances of games and the engagement of play” (Barab 2005; Williamson 2009). However, students generally do not find educational games fun to use or engaging; some say they are not challenging enough (Klopfer, 2009; Kirriemuir & McFarlane, 2004; Prensky, 2005).

One of the greatest challenges in designing an educational game is to marry the expectations of students with the requirements of educators. This is compounded by the fact that the term Serious Games means different things to different people.

The overall aim of this thesis is the **Research and Development of a Digital Game Based Learning Framework for Education: Designing for Educators and Students**.

This thesis therefore examines the expectations and perceptions of both educators and student learners with a view to designing and developing a game framework that is suitable for both parties. The outcome of this is then evaluated through a Phenomenography study.

1.1 Motivation

This thesis was born out of the position of being both a gamer and an educator; motivated by a personal quest to understand why this medium was not used more widely in the educational environment.

In 2006 whilst playing Elder Scrolls: Oblivion, I was made aware of the world of modding and that was the real beginning of my venture into serious games.
This journey led me through the minefield of semantics that is known as Serious Games, the learning curve of new concepts in the field of design and development of games, the realms of 3D modelling and introduced me to the concepts of research.
As an educator and a gamer, I could see the advantage of this medium but also understood some of the barriers that stood in the way of utilising it to its full potential. Was it actually possible to design and develop an educational game that would suit both educators and student/gamers alike?

1.2 Overview

The research draws upon a number of fields including Psychology, Education and Games Studies as well as the Game Based Learning interdisciplinary area of Game Based Learning.
Most research effort has concentrated on the aspects of Game Based Learning theories, how it is used or concentrated on the empirical evidence or lack of (Becker, 2005; Prensky, 2005; Whitton, 2012; Connolly et al,2012; Blunt, 2007; Girard et al, 2013; Sitzmann, 2011).
One of the main considerations for using Game Based Learning is to motivate and engage students in their learning (Iacovides, 2012, Habgood et al, 2005b). Though Whitton (2010) does question whether there is a relationship between the motivation to play games with the motivation to play to learn, she argues that the value of games are not so much in their motivational value but in the sound educational principles they can impart and their ability to engage.

One of the most common assumptions is that because games that gamers enjoy playing, motivates and engages them, any game will have the same effect on students. However the development of Serious Games needs to consider both sound educational pedagogy and game design principles in equal measure to avoid what Papert (1998) refers to as ‘Shavian Reversal’; throwing out the good features and keeping the bad ones.

The thesis therefore considers the theories found within the domain of Game Based Learning and principles found in game design, as well as motivational theories relating to both these fields, in an attempt to apply these to the design of a framework that would suit both educators and students. This work also highlights the perception of what Serious Games mean, not only to the various researchers within the field of Serious Games but also the expectations of Educators and Students.

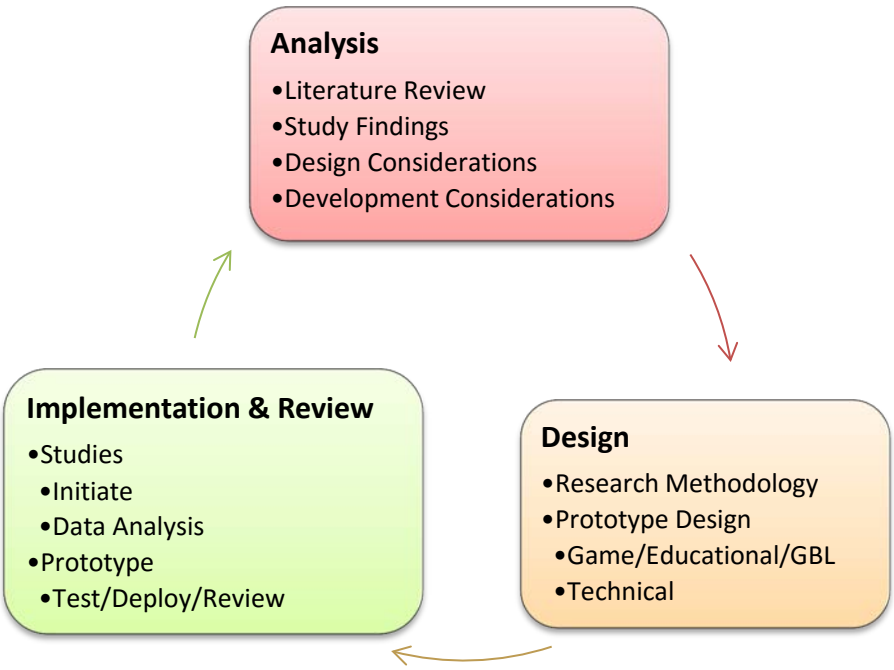
A conceptual framework was designed and developed to consider how to facilitate the needs and requirements of both Educators and Students, in relation to a Serious Game.

The final prototype was evaluated with a Phenomenographical study with the categories of description relating to games. These descriptions were placed on a continuum to showcase that experiences and emotions rarely are experienced on one extreme or another.

1.3 Approach

The whole process of a researcher is to iteratively develop their research and to show in their final thesis that their literature review informed their methods used and thereafter their discussion and final conclusions.

The very essence of this thesis is the iterative design and development of an educational game that was initially informed by literature review that led to an initial study to further inform the design and then to further reflect findings and proceed to the final design of the prototype, which of course then led to further analysis of the findings.



The analysis being the literature and staged studies which then informed the design and subsequently gave rise to the final prototype which enabled the journey to the Phenomenography study, thus ending it with the final discussion and review.

It is therefore presented as a journey of discovery and managed by the principles of software engineering using the agile methodology of analysis, design and development.

1.4 Terminology

Some of the terms used in the thesis have been included in the glossary, however some of these are worthy of special note and clarification. Educators in this thesis apply to anyone who educates and have been drawn from Primary, Secondary, FE Colleges and University Lecturers. Students relate to anyone who is a learner, this applies to students who are either in Secondary, FE or HE; Primary students were not considered in any of the studies. Learners might have been a better term, but Students was used in the main survey so the term

Students has been used throughout to avoid confusion but is synonymous to Learners.
The term Digital Game Based Learning (DGBL) is used interchangeably with Serious Games; DGBL being Educational Serious Games and many researchers have used both these terms to mean the same thing. At the start of the thesis, DGBL was used to refer to Serious Games.
The term GBL can relate to Game Based Learning but is often referred to in terms of Game Based Learning Theories.

1.5 Thesis Structure

This initial Chapter introduces the thesis; showing the structure, approach, an overview of the domain of research and its aim.
The section for the Literature Review includes 3 chapters covering the main salient topics required for this diverse study and includes Chapter 2, 3 and 4.

Chapter 2 provides a review of the relevant literature in the area of Games, Education and Game Based Learning. There is a specific focus on defining the concept of Serious Games and relevant aspects of Game Based Learning are examined.

Chapter 3 considers aspects of motivation and engagement within Serious Games. These concepts are used in Chapter 7 which investigates, amongst other elements, motivation of games in relation to games as well as what students consider important in learning.

Chapter 4 explores the design concepts in relation to games and covers such aspects as Mechanics, Dynamics and Aesthetics. It situates these elements as the most important factors that facilitate the emotions that create player experience. It also covers the rationale behind using a Role Playing Game (RPG) and how these can be mapped to Learning Theories.

Chapter 5 discusses the Research Methodology adopted for each phase of the study, from informal focus group, Mixed Methods, Quantitative Survey and a Phenomenography study. It covers the ethical issues as well as internal validity and causal effects.

Chapter 6 introduces the first phase of the preliminary studies conducted; an initial informal focus group used as a platform from which to start the main research aim. The aims of these were, to ascertain the views of educators and students on Game Based Learning. Having found such disparity between the two groups of educators and students ***is it possible to design and develop an educational game that would suit both parties?*** This chapter then analyses the first study, presents the basis of the main research question, and puts forward a framework for the design process. It also considers the platform and genre of the development tool; introducing the basic details of the engine to be used in the development.

Chapter 7 focuses on the Quantitative data analysis and discussion from the survey study. It raises and explores research questions covering the design and use of educational games including motivational factors of students in learning and playing. It also considers educators' perception of students' motivational factors.

- What are the reasons for not using Video Games? (Educators)
- What should be focused on in designing an educational video game? (Students and Educators)
- Was there a difference between Educators and Students view on what should be concentrated on most when designing educational games?
- What are students' motivational factors for learning subjects?
- What do educators perceive as students' motivational factors for learning subjects?
- What are the most important and least motivational factors for playing video games? (Students)

- What Genres of Games are played by Educators and Students?

Chapter 8 explores the actual design of the game, covering the final prototype quest and puzzle designs. It covers a journey of collaborative design with media students from a local college, through to the development of their ideas of the first main prototype. The chapter shows the final prototype and a snapshot of its design and development.

Chapter 9 brings the final study in the shape of a Phenomenography Study, comprising of students and educators' experiences of the final prototype.

Chapter 10 concludes the thesis and considers the limitations of the work as well as future directions.

Part II: Literature Review

"Experts may use the same term for different concepts, use different terms for the same concept, use the same term for the same concept, or use different terms and have different concepts" (Shaw and Gaines, 1989).

2. SERIOUS GAMES

In such an interdisciplinary field that draws upon research from a variety of areas such as Psychology, Education, Games Studies and the Gaming Industry, there is bound to be some disparity or confusion in some of the terminology and concepts used.

This chapter introduces the terms and concepts found in the domain of Serious Games; an umbrella term used to define games designed for purposes other than entertainment.

Section 1 defines the concept of games and play.
Section 2 introduces the domain of Serious Games, with a brief overview of its history.
Section 3 outlines the different types of Serious Games and their uses.
Section 4 defines the various concepts and terminologies used in Educational Serious Games and Digital Game Based Learning as well as exploring the different relationships of some of the most common terms.
Section 5 explores the question of what constitutes a Serious Game and the perception of Serious Games in educational research.

2.1 Understanding Play and Games

It is important to understand the concept of play and games, if one is to understand the motivation and engagement as applied to video games.

2.1.1 What is a Game?

What actually are games? How do we define a game? We know what a game is, anything from board games to digital games, from a game of football to a game of hide and seek; all are considered as games.

However, coming to a definition of what is a game, is more problematic. According to Wittgenstein, anything that is called a game, and by the very nature that it is defined by the word game should all have something in common. However he reasons that it is possible to find similarities and relationship but not find anything in common amongst them *"For if you look at them, you will not see something that is common to all, but similarities, relationships and a whole series of them at that"* (Wittgenstein, 1963).

2.1.2 Game, Play and Fun

One of the biggest problems is we define game with play; we say play a game. This would imply that in play there is an element of fun involved and that according to Huizinga *"the fun of playing, resists all analysis, all logical interpretation"* (Huizinga, 1938).

Caillois, who was influenced by Huizinga's Homo Ludens (1938) felt that, though Huizinga had analysed fundamental characteristics of play and its importance, his concentration was mainly related to *"the creative quality of the play principle play in the domain of culture"* and rules of certain types of games, specifically competitive ones (Caillois, 1958). Spurred by his work, Caillois went on to expand on the definition of play and classify games in his Man, Play and Games (1958).

He initially defined play as

- Free
- Separate
- Uncertain

- Unproductive
- Governed by rules
- Make-Believe

"There is no doubt that play must be defined as a free and voluntary activity, a source of joy and amusement. A game which one would be forced to play would at once cease being play" (Caillois, p123). Carse in his Finite and Infinite games of 1987 came to much the same conclusion*. "No one can play who is forced to play. It is an invariable principle of all play… that whoever plays, plays freely. Whoever must play cannot play",* (Carse, 1987 p11, cited in Schell, 2008).

Salen and Zimmermann (2003), define the juxtaposition of play and games and state that games are contained within play and are a subset of play. But they also state that play is a subset of games and as Rules, Play and Culture are the three aspects they consider to be in games, they conclude that play therefore is contained within games.

"Play is manipulation that indulges curiosity" (Schell, 2008). He feels it is important to consider what truly motivates the player to want to achieve rather than just concentrating on the goal of the player. This aspect of capturing a learner's curiosity will be a prominent consideration in the design and development of the prototypes in this research.

2.1.3 Games and Rules

The fact that some games have rules and others don't, does not mean that free-play is not a game, Caillois states that these are the games played with "as if". Games with rules do not need the as if, but these improvisation games, those that are free play types that children play, do have rules. They make the rules, sometimes as they go along but they have boundaries of sorts; if you have ever gone to a young child's tea party and had to drink from an empty play cup and go "Ah, that was lovely", you have been in that space. These boundaries you set (Wittgenstein, 1963) and what Caillois refers to as if or improvised free play games. (Caillois, 1958; Caillois, 2006)

Another aspect that Juul mentions is the juxtaposition of rules to fiction. He states that some games that players play, will not lose their appeal due to the less than perfect equipment used to play (in terms of aesthetic, monetary or sentimental value). Thus, playing in a less than perfect environment or the game being 2D instead of 3D, playing human chess or playing with old pieces as opposed to beautifully crafted set, would not lose their appeal and he refers to these as 'rules of irrelevance'. Whitton also feels that players would be forgiving of less than perfect environments (Whitton, 2012). Players will employ the same rules and feel the same excitement (Goffman, 1972 as stated in Juul, 2011), regardless of the less than perfect medium or equipment.

Juul proposes that games are both rules and fiction. Caillois on the other hand believes that games are either fiction or rules, *"Thus games are not ruled and make-believe. Rather they are ruled or make-believe"* (Caillois, 1961, 8-9). In his book, "Man, Play and Games" he refers to the improvised type of games that are make-believe and that *"the sentiment of as if replaces and performs the same action as do rules".* However, children who play make believe games often do have rules, and make-believe and rules do exist together and as Juul states that most games and video games are both ruled and make-believe. Juul in his previous work of 1998 had previously denied the use of fiction in games, calling it incidental and unimportant (Juul, 2011).

An aspect often mentioned in game studies is that between ludology (the study of games) and narratology (study of storytelling), and that they have been at odds for many years (Juul, 1999; Frasca, 1999; Aarseth, 2004); however whatever videogame scholars may feel, narratives can add to a video game.

2.1.4 Towards a definition of Games

Caillois (1958) categorised games as having the following characteristics: Agon, Alea, Mimicry and Llinx.

He considered Agon as having characteristics of games that are competitive in nature (Chess, Boxing, Football), which could be played either in teams or as single players against one another. Alea games were characterised by the fact that they were games of chance rather than skill. He classified those under

Mimicry as games that required one to take on roles, characters or that required suspension of reality. Games that gave you some type of adrenaline rush, feeling of vertigo or anything that disrupts perception were considered as Llinx games; example of this are games such as tobogganing or walking on tightrope. Caillois (1958) advances the notion that these 4 belonged to the domain of play and though divided by 4 distinct parts governed by distinct principles and containing games of the same type; they can also be placed on a continuum. At one end being a carefree experience of fantasy and free improvisation that he terms as Paidia and at the other end where skill, patience, effort or ingenuity is required which he terms as Ludus.

Whereas, Agon is the disciplined type of game often requiring sustained attention and the desire to win, Alea is pure chance, the outcome being in the lap of the gods, Caillois notes that this is peculiar to humans. Animals would never submit to an inanimate object to see if they won or lost; their game type consist of either playful simulations or competitiveness for a specific outcome that does not rely on pure chance (Caillois, 1958)

Juul's interpretation of what games are is not as prescriptive as that of Caillois and he states that it is open to consideration but does provide a 'classic game model'.

1. A rule based formal system
2. With variable and quantifiable outcomes
3. Different outcomes are assigned different variables
4. The Player exerts effort to influence the outcome
5. The Player feels emotionally attached to the outcomes
6. The consequences of the activity are optional and negotiable

(Juul, 2011)

Salen and Zimmerman (2003), proposed three types of game design schema that felt existed in games; Rules, Play and Culture. They expanded this with the following:

The Rules as containing the formal game design schema concentrating on the structure of the game with the focus on the logical and mathematical.

The Play as containing what they referred to as experiential, social and representational game design schema which focused on the player's participation with the game and other players.
The Culture being the contextual game design schema which focuses on the larger cultural context within which games are designed and played.
Their definition of a game is *"A game is a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome"* (Salen & Zimmerman, 2003, p96).
Their definition of a game incorporates the fact that they consider all games to be a system that players interact with consisting of artificial conflicts that limit a player by the rules that define the game and each game has a quantifiable outcome.
They consider that puzzles are 'special' kinds of games which have one or more correct answers, whereas Crawford (2003) does not consider puzzles to be games. Costikyan, (2002) on the other hand states that there are puzzles such as the early Zork that should be considered games but with a strong element of puzzles; his determinant factor is, if it is interactive with lots of puzzles then it is a game, if not interactive then it is a puzzle and a puzzle is not a game.
Salen and Zimmerman also stated that certain games such as Sim City and Multi Role Playing Games (RPG) do not have a quantifiable outcome. However they do state that these are games if you take that each mission is a quantifiable outcome and they have many goals, they state the same for Sim type games. They conclude that that it depends on how it is framed and is dependent on the eye of the beholder. They state that any definition that defines such a complex subject as games is bound to *"encounter instances where the application of the definition is somewhat fuzzy"* (Salen and Zimmerman, 2003).

In attempting to define what a game is, Schell, (2008) explores definitions from various sources and he suggests 10 of the most important game qualities that could help describe what a game is as the following.

1. Games are entered willfully
2. Games have goals
3. Games have conflict
4. Games have rules

5. Games can be won and lost
6. Games are interactive
7. Games have challenge
8. Games can create their own internal values
9. Game engage players
10. Games are closed, formal systems

He then simplifies his definition to cover all the above 10 by stating "*A game is a problem solving activity, approached with a playful attitude".*

Removing problem-solving activity from a game makes it into just an activity rather than a game. Problem solving can be anything from how to finish a level to more complex ones. According to Schell, though other activities might play important roles in a game, such as exploration or social interaction, they are not as important or as essential in the game (Schell, 2008).

Costikyan's (2002), definition is *"A game is an interactive structure of endogenous meaning that requires players to struggle towards a goal"*, it is worth pointing out that Costikyan is one of the sources that Schell explored to define his initial 10 point game qualities and is found in Schell's game quality from 6 to 8, in that, games are interactive, have challenge and create their own internal values.

According to Costikyan, if it is interactive and changes state then it is a game, he points out however, that Interaction alone does not make it a game, it has to have purpose, a goal - some form of decision, what he terms as purposeful interaction.

Though some may not consider SimCity a game, Costikyan feels that though one could state the game has no purposeful goal, it has many "goal-directed behaviour", having many goals that the player can choose from. Just as children playing their own make belief games, that make up their own rules and goals as in Caillois' improvised games, these are still games.

Games provide their own context, they are fantasy, they are not real. However some games attempt to simulate real world events. According to Costikyan, these types of non-fiction games that are drawn from reality or events that have taken place, establish their own endogenous meaning when that reality is "re-contextualized" into a game (Costikyan, 2002).

2.2 Introduction to Serious Games

The use of games for purposes other than entertainment is not a new concept. Educators have been using many types of games in classrooms from board games to role playing games (Botturi & Loh, 2008) and digital games such as basic quizzes and Flash based games have found their way into the classroom.
The use of games are not just restricted to the classrooms, the use of digital games in the Military began over thirty years ago with the advent of Virtual Reality Technology.
The advance of computer technology, together with the explosion of commercial games, with the ability to 'exploit' the software tools that are often made available by the developers easily surpassed the expectation of early Virtual Reality (VR), (Stone, 2008). It was soon realised that this new advance in 3D and games could deliver what VR had failed to achieve (Stone, 2005a).
So why the excitement and explosion of research in this area, why the name Serious Games? The concept of Serious Games or the use of games in the classroom is not new, what is new here is the media; that of videogames (Botturi & Loh, 2009).

2.2.1 The History of Serious Games

The term Serious Games is thought to have first been coined by Abt (1970) and was used to mean games other than video games as the industry had not yet been established. However, the term had a resurgence in 2002 with Ben Sawyer's "Serious Games: Improving Public Policy through Game-based Learning and Simulation" White Paper. Sawyer helped to shape the Serious Games Industry through the Serious Games Initiative which he co-founded. He instigated various conferences and in 2004 he also co-founded the Games for Health Project. The definitions of the modern Serious Games appear to have been greatly influenced by Sawyer (Djaouti et al, 2011a, 2011b). According to Djaouti et al (2011a), though Sawyer may have contributed to the definitions of Serious Games, Zyda is also considered to have contributed to the founding of the serious game movement in 2002 with the release of America's Army. Zyda

served as the principle investigator and development director of the first real commercial Serious Game, America's Army (Zyda, 2005).
Zyda (2005) defines Serious Games as *"Serious Game: a mental contest, played with a computer in accordance with specific rules that uses entertainment to further government or corporate training, education, health, public policy, and strategic communication objectives."*

Chen and Michael (2005) define Serious Games as *"Games that do not have entertainment, enjoyment or fun as their primary purpose"*.

Sawyer's definition of 2008 was **"***Resources from the field of videogames reapplied for purposes beyond entertainment including education, healthcare, productivity, defence, workforce development, & more*" (cited in Raybourn et al, 2012).

Chen and Michael's definition seems to be the one that resonates most with Serious Games and is the most quoted definition, either in its entirety or a derivation of it, however I feel that if the aim is to motivate and engage students, Zyda's definition, (2005) is one that resonates more with the aim of this thesis.

2.2.2 Types of Serious Games

'Serious Games' serves as an umbrella term for numerous types of games and incorporates many fields such as Education, Military, Health and Business to name a few; the distinction though is that they are games designed for purposes other than entertainment.
There have been several attempts to classify Serious Games, however there appears not be a general acceptance by all, of any of the existing classifications (Djaouti, 2011b).
Sawyer and Smith (2008) presented the following list, shown in Table 2.1, in their presentation at the Serious Games Summit in 2008; however they felt that this representation of Serious Games was not sufficient. *"Too Often Serious Games is Defined as only as that which the Definer Does"* (Sawyer, 2008)

Educational Games	Immersive Learning Simulations
Simulations	Social Impact Games
Virtual Reality	Persuasive Games
Alternative Purpose Games	Games for Change
Edutainment	Games for Good
Digital Game-Based Learning	Synthetic Learning Environments
Tactical Decision-Making Simulation	Game-Based "X"

Table 2.1: Serious Games Taxonomy. Sawyer and Smith (2008)

Sawyer and Smith proposed a classification using two major criteria as a matrix of Market and Purpose

- **Market:** Government & Non-Governmental Organization (NGO), Defence, Healthcare, Marketing & Communication, Education, Corporate, Industry.
- **Purpose:** Games for Health, Advergames, Games for Training, Games for Education, Games for Science and Research, Production, Games as Work.

An extension of Sawyers and Smith's taxonomy has been devised by serious.gameclassification.com from research conducted by Alvarez and Djaouti (2006 -2008) and adds Gameplay and Audience

- **Gameplay:** Game-based vs Play-Based
- **Purpose:** Message Broadcasting (Educative, Informative, Marketing & Communication and Subjective), Training, Goods Trading, Storytelling and Licensed
- **Market:** Entertainment, State & Government, Military & Defence, Healthcare, Education, Corporate, Religious, Culture & Art, Ecology, Politics, Humanitarian, Media, Advertising, Scientific Research
- **Audience:** General Public, Professionals, Students and by age group

As previously stated there appears no general acceptance of any of the taxonomies, (Djaouti, 2011b) but for the purpose of this thesis Military, Health, Games for Change (Social) and for Education (Digital Game Based Learning)

will be considered and briefly discussed. Though Digital Game Based Learning (DGBL) and Game Based Learning (GBL) are often used interchangeably, they are different as will be discussed in section 2.3.

Entertainment commercial games are also used as Serious Games, it is therefore important to understand how these fit into the realm of Serious Games. Classification of entertainment games are generally referred by genres of games which define them from the view point of common characteristics or style of gameplay; however each game can belong to several genres.

The common main genres have been listed below in Table 2.2, but it is not a definitive list and as technology and hardware capabilities move on so will the styles of games. In considering genres, it is worth mentioning that style of game can be different within each type of genre. Genres can also include have sub-genres; for instance a platform or shooter game would come under the genre of Action. Game style refers to gameplay or style of gameplay found; for instance a Role Playing game (RPG) can be Western or Japanese style.

The most common	Other important ones
• Action • Adventure • Action-Adventure • Strategy • Sport • Role Playing Games (RPG) • Simulation • Racing	• Exergame (Wii fit style) • Casual Games • Music Games • Puzzle • Educational • Serious Games

Table 2.2: Common main game genres

Though Commercial Off the Shelf (COTS) entertainment games are, and have been used in education (Gee, 2005a; Schaffer et al, 2005; Djaouti et al, 2011b) and other areas, there is a difference between games that are built purely for entertainment purposes that are used, referred to as *"purpose-shifting"* by Djaouti et al (2011b) and those that have been designed specifically for the purpose other than entertainment. These games are known as Serious Games and are for other purposes than entertainment.

Djaouti et al (2011b), split the concept of Serious and Games depending on the use and context of a game. These *"purpose-shifting"* games could be

considered as fulfilling the role of the Serious, whilst still being considered a Game, as they are being used for the purpose of learning rather than entertainment.

Another type of game that may be considered as belonging to the family of Serious Games are modifications (MODS) made to existing games (Djaouti, 2011). In this instance you could have two different types of games; a partial Serious Game or a fully-fledged Serious Game.

If the modification was total, in the sense that the designer had total control of the design of the Game and the Serious dimensions and elements, then it would be a fully-fledged Serious Game; if however the designer only had control of the Serious elements and had to fit it into a pre-existing Game then it could be considered as only partially fulfilling the criteria of a Serious Game (Djaouti et al, 2011).

2.3 Use of Serious Games

This section considers the use of Serious Games in some of the different areas before concentrating on its use in Education.

2.3.1 Military

The potential of the use of digital games in the Military began over thirty years ago with the use of simulators in 1981 in the US (Ulicsak, 2010) and has developed over the years to be incorporated in many training Simulations or Sims type of games used for training purposes. Here a distinction is made from Simulation to Sims, Flight Simulator being in the domain of Simulations and Sims being in the domain of simulated scenarios that enable participants to use the environment as a training ground. Often, the terms are used interchangeably.

In the early 80's Battlezone a commercial Atari game, was developed for use for the US Army as a training serious game for the Bradley military vehicle (Stone, 2005).

Simulated scenarios such as Marine Doom which is based on the First Person Shooter Game (FPS), Doom, allowed training sessions in a gaming environment that allowed soldiers to experience the feel of a battlefield, learn how to work in a team and practise their craft without the cost or danger that would occur in a real life training session (Ulicsak, 2010).

Tom Clancy's "Rainbow Six" was also modified for the US Army to train troops in fighting terrorists (Stone, 2005). Some of the games developed for the military also went beyond just using the FPS genres and introduced Role Playing and endowed the use of Artificial Intelligence (AI) for the virtual Non Player Characters (NPC) (Stone, 2005).

The most well-known Serious Game in use currently, is possibly America's Army, (2002) which was originally launched in 2002 as a PC game that was downloadable through the internet. It provides authentic experiences that were facilitated by Subject Matter Experts as well as an entertaining one that aims to reflect the lives, training, skills including career and values of a US Army Soldier. There were new versions in 2003, 2009 with the most recent being in 2013. Over the years more than 13 million players have registered for the game (Army Game Studio Press release, 2014). It has been used as a most effective recruitment method (Ulicsak, 2010), and a non-commercial version is used by the US for simulation and training purposes (Hsu, 2010).

Training Simulations have also been developed and deployed in the UK, Dismounted Infantry Virtual Environment (DIVE) being just one of them. The University Of Birmingham's Human Interface Technology Department have conducted a wide variety of Serious Games projects for the UK Military (Stone, 2005).

2.3.2 Health

Games for Health, is the name for the Serious Games that are developed for anything to do with health. There are two main Games for Health initiatives; the Games for Health Europe and USA. The games for Health UK is the British satellite for Europe (gamesforhealth.org, founded in 2010).

The use of Serious Games in the Health sector includes Sim type training, Computer Simulations, Rehab and Physical therapy as well as health education (Ulicsak, 2010).

Health games for practitioners tend to be Sims type training simulations or computer simulations. In terms of practising surgery for instance, Smith (2008), as cited by Ulicsak, found that the ability to practise in a virtual environment led to less critical errors when actual surgery was performed.

Triage Trainer (TruSim, Blitz games Studio) developed in 2010 was a Sim Type game environment and was developed to train first respondents to assess patients at an emergency and accident site.

Training simulations have been used from training practitioners to educating the public about health issues such as obesity as in Ian Bogost's Fatworld game (Persuasive Games, 2008, Ulicsak, 2010).

2.3.3 Corporate and Commercial

The use of Serious Games in businesses ranges from on-boarding (recruiting), training existing staff enhancing and improving communication skills amongst its members. It is also used in marketing by using casual games known as Advertainment to get visitors to a company's website (Ulicsak, 2010). Companies have also embraced the use of Gamification (a subset of Serious Games, which will be reviewed in the next section) to help maximise the potential of sales and interaction with the public.

L'Oréal Reveal and Coco Sims by Front Square (Front Square, 2011) are examples of games that have been successfully used within businesses.

2.3.4 Games for Change and Persuasive Games

Though there are many more categories of Serious Games that could be mentioned, two more are worthy of note. Games for Change and Persuasive Games and though these can fall within the remit of education, they are often considered as being distinct from the domain of other types of educational games as they are primarily concerned with the aim of promoting awareness and change in the area of social issues.

'Games for Change' are digital games that used for the awareness of social issues and for social change. The Games for Change is also an organisation, a movement to promote the creation and distribution of social impact games in humanitarian and educational areas; using digital games for social change

(gamesforchange.org). They are an international non-profit organisation and have 'chapters' in the US, Europe, Latin America, Korea, Australia and New Zealand Games for Change is a movement, a network of people working together as a community of practice using digital games for social change.

The term Persuasive Games was originally coined by Bogost (Bogost, 2007) and means much the same, in that it focuses on persuading change. His view is that videogames open a new domain of persuasion and thus have a new form of rhetoric which he calls *"procedural rhetoric",* and he believes that this *"unique persuasive power"* can lead not only to social change but to long term social change (Bogost, 2007). However his Persuasive Games domain, is not only limited to the humanitarian and educational efforts, it covers advertisers, trainers and policy makers. The term Persuasive games therefore brings confusion to the categorisation of Serious Games, on one hand it can be considered a subset of Serious Games as it advocates change through the art of persuasion but on the other hand it is also synonymous with the company Persuasive Games, (PersuasiveGames.com) co-founded by Bogost.

2.4 Conceptualising Games in Education

Educational games come in many guises, from the simple to the complex and the tags associated with Game Based Learning or the use of games in education are equally diverse. Tags such as Serious Games, Casual, Gamification, Simulation, Game Based Learning, Digital Game Based Learning and Edutainment only seem to add to the confusion of those seeking to use this medium in their teaching.

Educational games fall into different domains, depending on context. They can be anything from games that are used in educational establishments following a particular curriculum, for the general public usually in the style of edutainment or games for social education or change. Games such as Math Blaster, Carmen San Diego, Immune Attack, Oregon Trail, Quest Atlantis and Civilization are a few examples of these (Klopfer, et al, 2009).

Many educators have a problem distinguishing what is usable and what will work or do not know what is out there. This is compounded by the fact that what empirical evidence there is to support or not to support the use of games in the classroom is hard to find, contradictory or confusing. This section looks at the various views and concepts within this domain. The term Serious Games, Game Based Learning and Digital Game Based Learning are often interchanged in the field of educational research.

There have been various attempts to model how the different terminologies fit within the domain of Game Based Learning and Serious Games and this section brings together some of these in an attempt to arrive at definitions that will be used within this thesis.

2.4.1 Serious Games within the educational context

Breuer and Bente's view of how Serious Games relates to other similar educational concepts is illustrated in Figure 2.1 showing their classification of the various terms and shows the use of Serious Games within the context of education (2010).

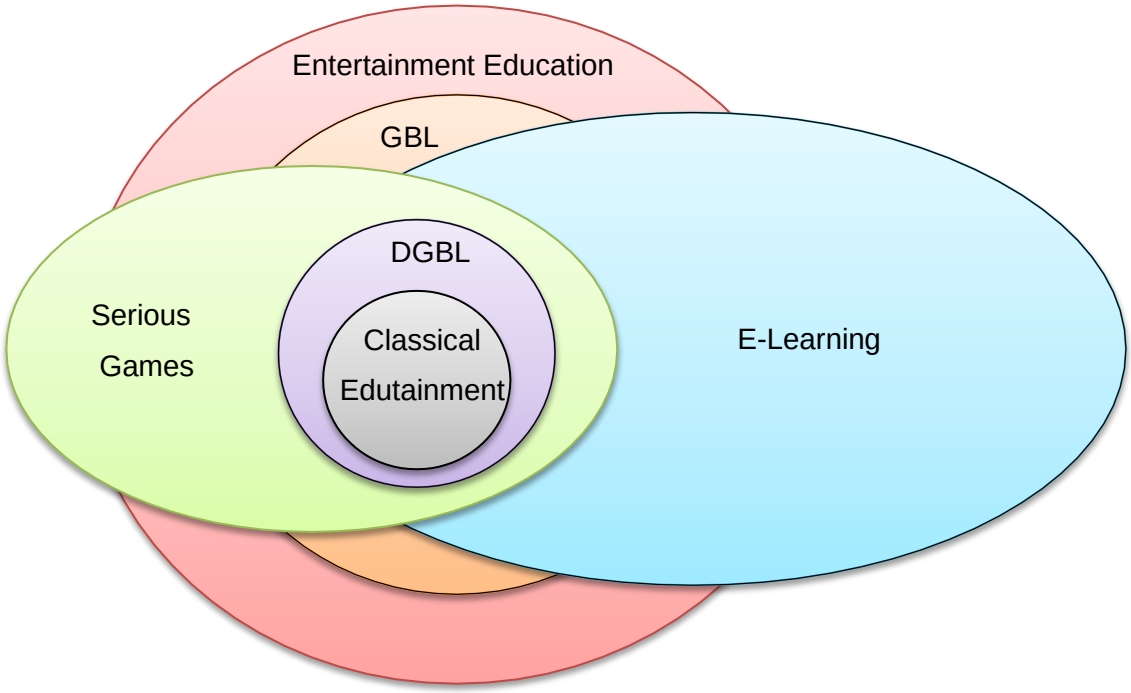


Fig. 2.1: The relations between serious games and similar educational concepts (Breuer and Bente, 2010)

Breuer and Bente, (2010) suggest the following:

- Serious Games (SG) is the use of games for the purpose of education and learning and is the umbrella term that incorporates games for learning, training and its fields encompass many areas as well as education (Businesses, Health, MOD etc.).
- Digital Game Based Learning (DGBL) is a subset of SG and its sole purpose is education.
- The Classical Edutainment Games that were so prolific in the 80's are a subset of DGBL; these however concentrated more on rote style learning or were considered to be too entertaining and not enough learning (Klopfer, et al, 2009, Breuer and Bente, 2010).
- Entertainment Education is the attempt to make education more fun
- Game Based Learning uses any type of games (board, digital etc.) and Breuer and Bente situate as a subset of Entertainment Education.
- E-Learning is more about using digital media and learning, its primary focus is not on games, though it can be, in which case it will then become serious games (Breuer and Bente, 2010).

Therefore, from this one can regard Game Based Learning as the umbrella term in education for learning with games and that Digital Game Based Learning uses any form of digital media and is a subset of Serious Games. However these definitions need further investigation and are given further consideration from other researchers' point of views in the following sections.

2.4.2 Serious Games, Simulation and Virtual Worlds

Though Breuer and Bente's view helps to clarify how to see Serious Games within the broad spectrum of the different terminologies, Aldrich's view as seen in Figure 2.2, is concerned with distinguishing the difference between Serious Games, Simulation and Virtual Worlds (Aldrich, 2009). Aldrich sees them as points along a continuum, all instances of HIVES, Highly Interactive Virtual Environments. He makes a point of stating that Simulations, Games and Virtual

Worlds are different, each with “its own affordances and purposes”; however, he further speculates that there is a relationship amongst Virtual Worlds, Simulations and Games. He situates Virtual Classrooms and Virtual Worlds/MMO within the Highly Interactive Virtual Environment and places Class Games, Frame Games, Group Challenges and Serious Games within Games. In the Simulations area, he gives examples of such simulations as War Games and Flight Simulators.

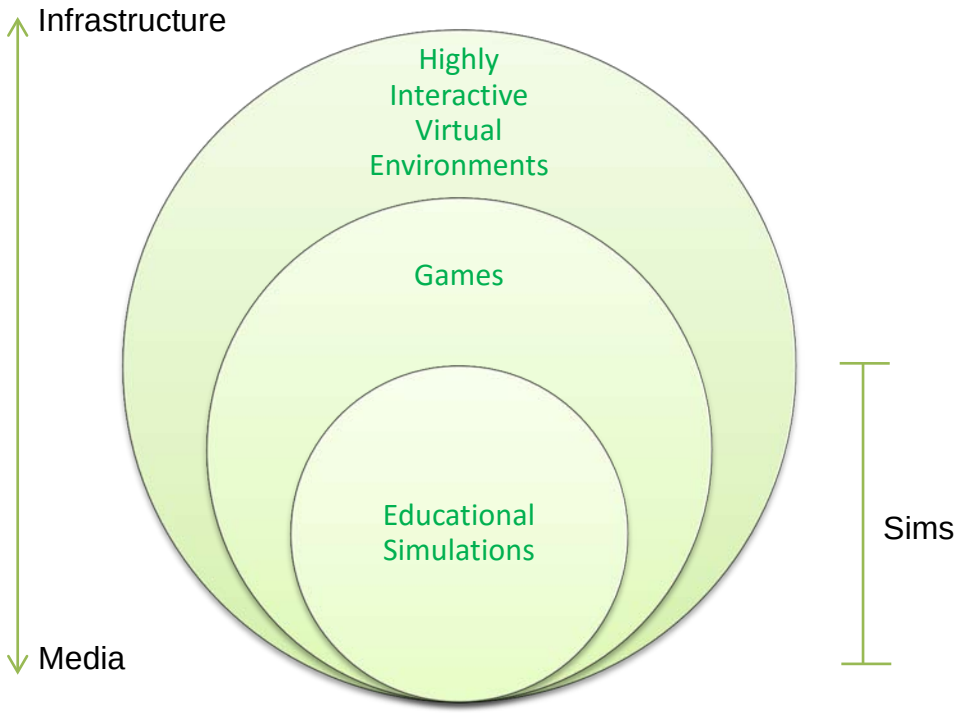


Fig. 2.2: Modified from Aldrich’s HIVES

He proposes the following

- Games take place in some kind of virtual world
- Simulations share key characteristics with games
    - Take place in virtual worlds
    - Have rules and constraints
    - Focus on a particular goal
- Simulations differ from games in that
    - Rules, challenges and strategies are more refined

    - They enable transferrable behaviours and skills
- Participants often move from one mode to another as they become more competent and more comfortable with the environment
    - Starting with Virtual Worlds to Games and finally to structured Simulations

Aldrich's interpretation of virtual worlds is that of 3d social environments, such as multiplayer ones but without the focus of a particular goal or the ability to advance through a scenario. His take on a game is that though they may be contained in a 3d virtual world and have specific feedback mechanisms and rules, they are not as defined or rigorous as simulations and are usually for entertainment purposes. Whereas he feels educational simulations can be directly transferred into the real world due to their rigorous design (Aldrich, 2009; Ulicsak, 2010).

It is strange that Serious Games are placed within games in Aldrich's diagram (Figure 2.2) and yet he advocates the use of the word Sims for inclusion within Serious Games and Simulation; inferring that in order to be a Sims it requires a mixture of Serious Games and Simulation, which implies only a Sims type of game is to be deemed as a truly educational tool.

2.4.3 Simulation, Learning and Games (Martens et al)

Aldrich's view is not a belief shared by Martens et al who believe that Simulation, Learning and Games need to be found in equal measures as seen in Figure 2.3 in order to make it a Serious Game or as they call it Game Based Training.

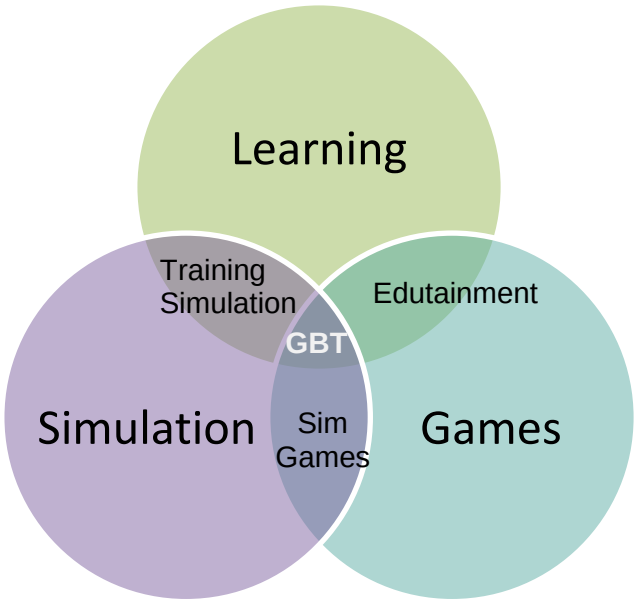


Fig. 2.3: Interplay of pedagogy, computer science and games, Martens et al 2008. (*Adapted)*

Martens et al (2008), state that Game Based Training, which is their terminology for Serious Games requires all 3 elements of Simulation, Learning and Games to be called Game Based Training.

Remove the Games element from the 3 and you get a Training Simulation such as those that are used for military training, removing the Learning Pedagogy element instead would mean you end up with a Simulation Game suited purely to entertainment and if you removed the Simulation element, leaving just the Games and Learning, you would end up with simply with an Edutainment game which they consider only suitable for primary (Martens et al, 2008).

So the conclusion here is, if you remove the game elements it is simply a training simulation, yet many such simulations are called Serious Games. An example of this is Eckhardt's simulation (2012) which will be discussed in section 2.5.1

2.4.4 Terminology used in Game Based Learning

The previous section looked at some models to clarify how Serious Games and Digital Game Based Learning fit into current research. This section will define

some of the extra terminologies that have come to light in the previous section and introduce some new ones.

Virtual Learning Environments vs Virtual Worlds

Virtual Worlds and Virtual Learning Environments are often used interchangeably but can mean different things depending on the context they are used in. Virtual Learning Environment (VLE) can mean anything from Virtual worlds such as Second Life where the environment is 3D to a set of web pages that allow chat, discussion boards, forums and anything that is considered to have some social interaction (Barkand and Kush, 2009). This term is also used in many educational establishments to enable students to access online material and should really be considered E-Learning (Martens et al, 2008). Some E-Learning portals can of course be a Virtual World such as Second Life; but again unless it contains elements of Serious Games it would only be considered as a container (Aldrich, 2009) or a form of Virtual E-Learning World (Martens et al, 2008) which contains virtual classrooms (Aldrich, 2009).

The assumption that because people play games does not mean that they will be predisposed to be motivated or engaged with a 3D environment such as second life (Barkand and Kush, 2009); there is a vast difference between a VLE and a game and though some game elements are added in some of these virtual worlds, not all of them can be considered a game.

It is often thought that adding an Avatar or including simulations in a 3D environment is the equivalent of a game (Aldrich, 2009), just as including points and badges, known as Gamification, might make learning content more fun (Muntean, 2011) but it does not make it a game.

It does not mean that using the above types of solutions, does not create a valuable learning opportunity for students (Falloon, 2010), but only that they should not be mistaken for games.

Simulations

Though Simulations are part of Serious Games, Computer Simulations themselves have been used for many years.

Simulation itself is a word that can mean many things to different people. A simulation can be a scenario that is used in business to simulate business practices and outcomes or it can also mean a simulation in the sense of an experiment on a model or flight simulator. Some games have simulations incorporated within them (Driving, flight simulator types of games), but not all simulations are games (Martens et al, 2008; Aldrich, 2009).

The meaning of the word simulation is to attempt to copy real life. Simulations can be interpreted in two broad ways. It can mean to simulate real life events or imitating a real life situation or scenario. These can be anything from training games, war games to business analysis games. It can also mean an experiment of some sort run on models to produce a behaviour that can then be observed; for instance, a model of a spring and inputs can show the reaction of the model. They are often used to simplify complex matters and can be developed in many formats from simple 2D Flash or Java Applets deployed through a web page to complex 3D models deployed in a virtual environment. They can also be shown as an animation or react in some of behaviour through user input.

However, having a simulation to simplify and represent the real world (Physics experiment, for instance), in a virtual environment does not make it a game, though games can include many simulations. A common term in Serious Games is Sims, to denote a simulation type of game. The term Simulation can refer to a Sims, a computer simulation of a model or simulation as in Flight/Driving simulation or a game with virtual environment that simulates reality for training purposes.

This confusion of simulation and games is not helped by Becker & Parker's statement (2009, p4), *"While by far not all simulations are games, in this community all games are simulations (DES)."* Their main argument here is if we class games as simulation it will be more accepted by educators (p6), though she does concede that there is a debate about the terminology.

Casual vs hard core games

Casual games are games that you see people playing just to pass the time, for a few minutes (though some will play them for hours); they are the games that are played while waiting for another event to occur; waiting for the train, waiting for your dinner. The types of games, I call playing with time to kill.

They are for people who are not serious about games and often are distinguished by simple rules. They come in a variety of guises and genres and are played on anything from consoles to mobile phones. Pac-Man (Namco, 1980) is probably the most well-known of these. They are engaging and addictive but aimed at casual players.

Complex games, those sometimes referred to as hard core are those most players consider as proper games, those such as Call of Duty series (Activision 2003-2015) or World of Warcraft (Blizzard Entertainment, 2004). These are the types of games that are referred to by Prensky as complex games (Prensky, 2005).

2.4.5 Gamification

Gamification gained momentum in 2010 and has flourished in the business sector.

The main difference between Gamification and Serious Games is that gamification uses certain game elements to engage and motivate; it can have some learning. Whereas Serious Games primary focus is on learning through engagement and motivation by using some elements of games but don't necessarily just include points, rewards and leader-boards; and those that do are usually using gamification techniques. This gamification technique is used mainly as a form of competition and not everyone wants competition, finds them motivating, or fun (Dominguez et al, 2013).

Proponents of serious games rarely refer to gamification when talking about serious training applications that use game elements or the essence of gameplay to motivate and engage trainees. One hardly ever hears of a hospital or military training application that is considered as a serious game as gamification; this seems to contain itself within the remit of either education or

business. However, Deterding et al (2011), state that gamifications for these areas could exist.

According to Deterding et al (2011a) *"Gamification is the use of game design elements in non-game contexts."* Deterding et al (2011b) adding further detail to reference gamification as *"an informal umbrella term for the use of video game elements in non-gaming systems to improve user experience (UX) and user engagement ",* thus clarifying their term of game design elements to video game elements and of non-game context to non-gaming systems.

There is nothing new in the concept of gamification; giving out stars in primary school for achievement could be considered a form of gamification; the concept of using game elements that Deterding et al (2011a) previously referred to in a non-gaming context.

Though most consider Gamification to be different to Serious Games, Kapp (2012) feels that Gamification has been misunderstood by those that advocate its use purely as a means to add game elements of points, rewards and leader boards often to an existing system to engage and motivate. He states that there are two ways to gamify, by content and structure. Zichermann and Cunningham, (2011) consider it as a way to engage and solve problems through the process of "game thinking" and "game mechanics" (Zichermann and Cunningham, 2011).

The term Gamification is a strongly contested term and has had proponents of Serious Games and Gamification having heated debates on its conception and use (Deterding et al, 2011).

Though education seem to be excited by the possibilities of what Gamification can achieve, it should not be mistaken for Serious Games; it is however a concern that some games that purport to be Serious Games are in fact no more than mere Gamification or other types of Digital Game Based Learning in the guise of a Serious Game.

It is therefore important to clarify the perception of Serious Games and ascertain what they actually are.

2.5 Video Games as Serious Games in Education

"Too often, Serious Games is defined only as that which the definer does!" (Sawyer, 2008)

Researchers often state "videogames engage and motivate players" as the reason for using Serious Games, giving examples of commercial entertainment games as a starting point to their arguments.
However, they then often use types of games not affiliated to video games to support their arguments that it works or to show how to design an educational game. This section looks at the available research and puts forward some possible rationale for the confusions and misdirection of the term Serious Games within education.

2.5.1 What type of game is a Serious Game?

In their literature review of empirical evidence, on computer games for entertainment purposes and Serious Games, Connolly et al (2012) analysed journals with respect to learning and engagement. However they split their review into Games for Entertainment, Games for Learning and Serious Games; this compounds the misunderstanding as Games for Learning are considered a subset of Serious Games as discussed in section 2 (Zyda, 2005; Chen &Michael, 2005; Sawyer, 2008; Breuer & Bente, 2010) . The assumption here then, is that Games for Learning are games for education and that the Serious Games category fits all the other subgenres of Serious Games.

Connolly et al (2012), situated their review by the following learning and motivational outcomes

- Affective and motivational outcomes
- Behaviour change
- Knowledge acquisition/content understanding
- Motor skills
- Perceptual and cognitive skills
- Physiological outcomes
- Social/soft skill outcomes

(Connolly et al, 2012)

They used the above criteria to look at the 3 categories; entertainment games, learning games and Serious Games.

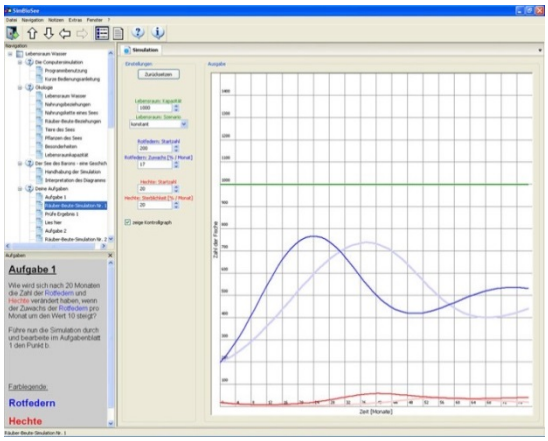
Connolly et al findings were *that "Simulations were the most frequently reported games in studies of games for learning, with puzzle games the second most popular and overall 80% of games for learning were either simulations or puzzles."* (Connolly et al, 2012). However, all types of simulations were included under one banner and no distinction was made. These were anything from business simulation, computer simulations, and from Second Life to Sims type games.

"… digital games can be learning tools, motivators and generators of curiosity." (Breuer & Bente, 2010). Digital games can be many things; they can be a learning tool or a learning game. Obtaining the motivation and engagement of a videogame means using the concepts of what videogames have to offer. Most Educators are great at designing learning tools but this is not the same as designing games that educate.

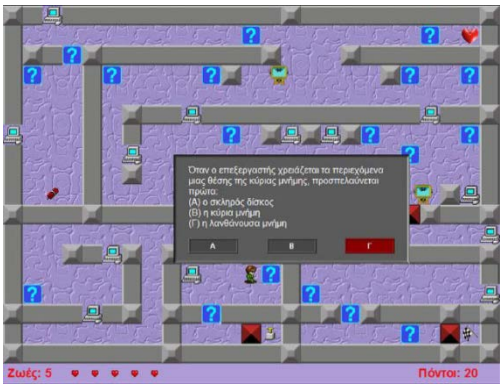
Regarding findings for the entertainment games, Connolly et al state, *"The most frequently occurring studies of entertainment games looked at the impact of games generally (22), but there were also studies on all of the different game genres, with action games (11) the most popular followed by role-playing games (7) but also including fighting, strategy, adventure and sports games."* Most of the studies were generic studies with videogames relating to such areas as motivation, immersion, addiction, violence in games as well as acquisition of skills and expertise. Some used specific videogames such as World of Warcraft, Neverwinter Nights to generic type of online games (Connolly et al, 2012).

Figure 2.4 shows a sample of the games reviewed.

Example of GBL games used in Connolly et al reviewed journals



A. Simulation type as used in Eckhardt's study, (2012) in Science (ecosystems water) as reviewed by Connolly et al 2012.



B. Game used in Papastergiou's study (2009) in Computer Science as reviewed in Connolly et al 2012.

Example of entertainment games used in reviewed papers

C. Weibel et al, used a modified version of Neverwinter Nights game to research the experience of playing online games with computer vs human opponents (Weibel et al, 2008).

D. Study to define and measure immersion found in games (Jennett et al, 2008) as detailed in Connolly's review.

Fig. 2.4: Sample of games reviewed

The first two game styles (A and B) are nothing new and the use of computer simulations and simple games have been successfully used in education for many years.

Game style (A) simulation, did not aspire to be shown as anything else than a computer simulation and though, Serious it could not really be considered a Game. These types of Game Based Learning would fall in the educational learning tool or Computer Aided Learning (CAL) (Girard, 2013). Simulations work, and we have been using them for years. *"We have plenty of empirical*

studies about simulations over the last 25 years. We know simulations work. We know simulations improve performance. We know simulations improve learning." (Training 2006 Conference and Expo, Cannon-Bowers) as stated by Blunt (2007).

Game style (B) by Papastergiou, on the other hand though considered a game, does not exploit what videogames have to offer. In her findings and discussions Papastergiou does state, *"that students expect to find in the educational games that they use within school the elements that they encounter in the games that they play outside school"* and further suggests that educational games should include features that the students experience outside of school in order to meet the expectations of students and keep them engaged (Papastergiou, 2009).

There is nothing wrong with using elements of games to make simple style games that make learning certain facts easier or using computer simulations, but this strategy does not make it a videogame.

Using some of the gamification elements may be conducive to gaining some of the motivational and engagement aspects that we seek, but in doing so we lose some of the true essence that makes this medium a choice for those that play games; the experience, the emotions that the game elicits that are on the whole why people play games (Schell, 2010).

The review by Connolly et al, (2012) compounds this disconnect that seems to be prevalent in the domain; with research about videogames on one hand and then comparing non-videogames to see if learning and engagement has occurred. Their discussion includes the fact that though there were more genres used in the papers they reviewed for entertainment, simulations and puzzles were more prevalent in the GBL and Serious Games categories because their *"use in education is already established"* and they also consider that it could be because educators are unclear on how to use these other genres in their teaching. They go on to suggest that *"To encourage the use of games in learning beyond simulations and puzzles, it is essential to develop a better understanding of the tasks, activities, skills and operations that different kinds of game can offer and examine how these might match desired learning outcomes."* (Connolly et al, 2012). It appears there is still a long way to go and

our understanding of what videogames have to offer still needs to be worked on. Connolly's literature review was excellent for showing the empirical evidence that exists for computer games and Serious Games but also highlighted the disconnection between videogames and Game Based Learning as well as the interpretation of Serious Games.

The expectancy of using videogames to support such aspects of motivation and engagement amongst other qualities, and then represent it in a totally different context and type of games to support these claims only adds to the confusion. It was difficult to understand why in such a study, videogames for entertainment were included, if it wasn't to relate it to Serious Games. If it was, then it also highlights the lack of cohesion in this domain; comparing videogames with non–videogames to show learning and motivational outcomes.

In an online article, "Once Again, Games Can and Do Teach!" (Kapp, 2013), Kapp mentions Connolly's, Sitzmann's and Blunt's studies to highlight that empirical evidence exists to show that games work for education. The concern here is not so much on evidence or the lack of evidence but that most of the research he considers start on the premise of using games because videogames "motivate and engage", but then use this as a foundation to judge games that are not videogames; this link to videogames is misleading.

As an example, let us look at Blunt's study (2007). His discussion includes video games and video game design, and how it has changed over the years. *"It has gone from a single programmer designing a game to a team of individuals with multi-million-dollar budget"*. He also states that youngsters are used to *"highly interactive systems"*. The aim of the study was to provide empirical evidence to determine if Game Based Learning worked and he states that the purpose of the research was therefore to *"determine the relationship between the use of video games and learning"*. This was one of the first studies to provide empirical evidence (Blunt, 2007).

Blunt (2007), uses the causal-comparative approach; stating test scores as effects and the game play as the possible causes. His studies explored the difference in achievement between those who used video games and those who did not. He uses 3 lots of different classes at the same University. One was first year business students, and two third year groups of students, studying

economics and management studies. These three groups were then split into two; one group used video games the others did not. The data collected included game use, test scores, gender, ethnicity and age. His data analysis methods included ANOVA, chi-square and t-tests.

Blunt mentions good video game design aspects such as Rules, Goals/Objectives, Challenge and Engagement, alongside Keller's (1987), Attention-Relevance-Confidence-Satisfaction model (ARCS). However, what was not made clear was whether the games used for the studies were in fact video games, simulations or other types of games. Having researched these games, I found they were strategy type simulations and yet his paper includes video game design principles rather than including design for simulations.

His study showed the use of Industry Giant II, a business simulation for the business, and Zapitalism, a fantasy business simulation for economics and Virtual U for a Management course. It seems to me that business simulations have been used by academia for a long time, and it was a shame the study was not aimed at other learning activities. Use of these strategy simulation types in business related courses is nothing new.

The epistemic frame of video games encompasses more than just considering strategy/simulation type of games. Video games include a host of genres which were not considered; simulations do not reflect all that video game technology can offer.

His conclusion is that *"at least in some circumstances, the application of Serious Games significantly increases learning"*, would appear sound, but he has only concentrated on performance tests and one could argue that learning is more than just doing well in tests. Blunt also mentioned in his studies about Digital Natives and yet the method of assessment is based on tests, which seems to run contrary to the philosophy that Digital Natives learn differently (Blunt, 2007).

Sitzmann's study (2011) is another example of how the merits of video games as a motivator are introduced and then related to a study of simulations that do not fit into a category of video games. Girard et al (2013) felt that Sitzmann's selection for the meta-analysis included games that did not resemble modern style simulation games or had no ludic content. Girard et al (2013) felt that the

majority of the ones chosen for Sitzmann's study should be considered as either CAL or educational tools but not simulation games (Girard et al, 2013).

2.5.2 Serious games and videogames

In section 2.4, the definition of Serious Games, its use and position in education was looked at. This aspect of defining Serious Games is further explored but in relation to the interpretation of what is considered as Serious Games to the juxtaposition of what is considered as a videogame by Marsh (2011) and Girard et al (2012).

Girard et al (2012) adopted Marsh's Serious Games definition (2011) in order to conduct a meta-analysis of studies in order to ascertain how effective Serious Games were as educational tools. *"Serious Games are digital games, simulations, virtual environments and mixed reality/media that provide opportunities to engage in activities through responsive narrative/story, gameplay or encounters to inform, influence, for well-being, and/or experience to convey meaning" (Marsh, p63).*

Girard et al (2012) felt that the only difference between Video Games (VG) and Serious Games (SG) were their intended purpose; SGs were VGs with a useful purpose. The purpose of their study was to review the results of studies carried out from 2007 to 2011 on the effectiveness of learning and engagement of SGs and VGs. They discounted, from their analysis, those studies without sufficient or inappropriate analysis or those that used games that were not VG or their definition of SG (VG with a purpose).

There is a point to be made here, that if the authors or researchers give an expectation of the benefit of videogames, but then deliver or analyse games that clearly are not videogames, then there is cause for concern. However, one has to be careful of discounting any type of Serious Games that does not fit with a particular interpretation of what ones believes to be suitable enough to be considered as SG or DGBL. There are many good digital games, simulations or educational tools that may not fit totally with videogames concepts but it does not mean that they have to be discounted as ineffective; only that these studies

should not give an impression of that the benefits are due to the games being the same as videogames.

One could consider looking at the educational game as being on a continuum of gaminess (Marsh, 2011) or on a continuum of educational tools to educational games rather than totally discounting the studies.

The expectation of what a well-designed entertainment game could deliver and what a Serious Game often delivers shows disconnect between understanding the nuances and differences of the two types.

Marsh (2011) states that as Serious Games cover many areas from education to military and its purpose can be anything from training, to learning, to changing attitudes; the term Serious Games should be looked at in relation to all practitioners and framed along a continuum of game characteristics depending on the purpose of the Serious Games. He also suggests that the game characteristics, such as challenge, play and fun are borrowed from video games and that we need to look beyond these characteristics and to frame our understanding of Serious Games from one end of what he calls gaminess to the other end of the continuum that has little gaminess, as shown in Figure 2.5 Marsh, 2011).

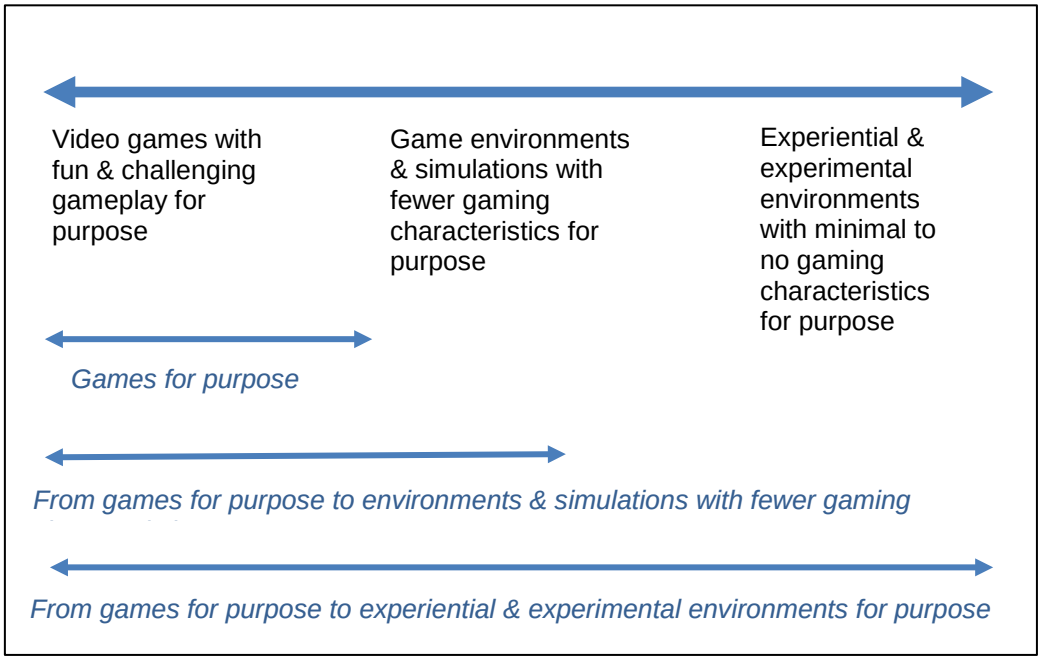


Fig. 2.5: Marsh's Continuum of Serious Games (Marsh 2011)

He proposes 3 main ranges within Serious Games. That the first range encapsulates all the characteristics of games; entertainment games with a purpose. The second range includes environments and digital media that have reduced gaming characteristics. The third range includes what Marsh terms as *"experimental and experiential environments for purpose"*; it has little or no gaming characteristics, but its aim is to provide meaning (Marsh, 2011).
Marsh describes various games that fall into each range; for instance he places America's Army into range 1, Virtual Iraq (to treat Post Traumatic Stress Disorder) in range 2 and SnowWorld (used for pain reduction for burn patients) in range 3 (Marsh, 2011).

However, it may also be worth considering within those ranges of Serious Games, there is also another continuum, that of Purpose; though Marsh (2011) considers all these as games "for purpose", one has to consider another type of purpose that for which the game is intended. The design and focus of a Serious Game is dependent on its purpose; the purpose to train soldiers, teach about health, change behaviour or attitude as in persuasive games. Different emphasis and different types of games would fall within the range that Marsh has proposed.
As seen in America's Army, game characteristics such as fun, challenge and play are used; its aim being to recruit (Zyda, 2005). The version of America's Army used for training however had a different purpose and would have included less 'gaminess' as Marsh (2011) refers to Serious Games that have less game characteristics.
The version of America's Army's that was used for training purposes had a different purpose again to that of Virtual Iraq which was used to treat Post Traumatic Stress Disorder (PTSD); there would contain less game like elements than in the former Serious Games (Marsh, 2011).

Using Sawyer's (2008) classification of Market and Purpose, in section 2.2.2, this difference is not only seen within the same Market, but also in the Purpose. The Purpose of training for instance is different in health, business or military and the design of the game would be different.

A game for emergency triage as in TruSim's Triage Trainer, may include an immersive environment and challenge but its aim is to train users to respond to casualties in an emergency situation and to develop accuracy in prioritising casualties. This would be different to a Serious Game to train for different types of surgery; the latter may be designed as a pure computer simulation or include an immersive environment but would have little of the elements of gameplay or gaminess.

One would presume that the reason for using Serious Games in the above examples of training would not be the same as using Serious Games for education; one hopes that those being trained are already motivated. If an educational game is primarily aimed.at motivating and engaging amotivated students, then the emphasis would be to try and motivate them first. Therefore, the design for this type of game would be different to that of a training game. Of course, the design would again be different if the students are already engaged and motivated.

2.5.3 Educational Pedagogy in Serious Games

Educational Learning Theories for games are referred to as Game Based Learning Theories.

It is understandable that the main focus of educational game design focuses on the areas of how educational pedagogy can fit into games; it is a way of convincing educators to make a connection with games (Becker, 2005). Unfortunately only concentrating on this aspect, often leads to a disconnect of the final design concepts within the game; one needs to incorporate both game design principles as well as educational pedagogy elements in equal measure (Fabricatore, 2000; Klopfer et al, 2009; Habgood and Ainsworth, 2011).

Several learning theories have been used to describe how learning occurs through games and specifically through gameplay and is used as a basis for designing educational games.

Mayes and de Freitas (2007) consider Associative, Constructive (Individual), Constructive (Social) and Situative as the main learning components. The

theory of Associative Learning is mainly concerned with how one learns by association and how this is externally manifested by behaviour and is concerned with building concepts or competence in a step-by-step manner. Use of mnemonics is an example, where learning by association helps accurate recall. Approaches in Associative Learning include Guided Instruction, Drill and Practice and Instructional Design; the key theorists to this being Skinner and Gagne.

The proponents of the Individual Constructive Theory are Piaget, Papert, Kolb and Biggs. This theory is about achieving understanding through active discovery. Kolb's experiential is an example of this approach as is Problem Based, Research Based, Experimental Learning and Cognitive Scaffolding.

Social Constructive theory is concerned with achieving understanding through dialogue and conversation. Peer and collaborative learning is at the heart of this theory and reflected in Vygotsky's Social Development and Zone of proximal Development and Laurillard and Pask's Conversation Theory.

The Situative theory is usually applicable to work related learning. It draws from Lave and Wenger's Communities of Practice (Mayes and de Freitas, 2007).

Over the years there has been a shift of perspective on learning models; starting with the drill and reinforcement method of Behaviourism to focusing on learning as a mental process in Cognitivism. Constructivism was the expansion of Cognitivism to include learners' construction of their conceptions through personal discovery, transformation and revision of complex information (Whitton, 2010; Siang and Rao, 2003). Social Constructivism is an extension of this, however rather than focusing on individuals it advocates that learning takes place in social constructs. The main research in Game Based Learning theories has concentrated on these.

Some proponents of Game Based Learning Theories, including Whitton (2010) consider the key theories to be Constructivism, Experiential Learning, Collaborative Learning and Enquiry Based Learning. The three main principles of Constructivism being considered are, Situated Cognition, Cognitive Puzzlement and Social Collaboration (Savery and Duffy, 1995; Whitton, 2012).

Situated Cognition, whereby meaning and understanding are derived through the interaction with the environment, and that the context as well as the content,

goal and nature of an activity plays an important role in aiding the individual's construction of it; (Whitton, 2012, p11) the ability to map to real life situations, real world activities or situations that one wishes to emulate and goals that the individual can relate to.

Cognitive Puzzlement is often referred to as cognitive conflict and is where perceived inconsistencies or conflicts provide a stimulus for learning (Whitton, 2012); the idea being that a learner's anxiety and their realisation of an unexpected or puzzling situation is a step towards resolving it (McDougall, 2002).

Prensky (2001) states that players learn without realising it, is disputed by Whitton (2012) who states that this undermines the role of the learner and it is important for them to know they have learnt something.

Kolb's Experiential Learning Cycle is the idea that students learn by exploring and trying things out, the cycle developing an active learning experience through interaction and feedback is found in games and is a suitable conduit for this type of learning (Whitton, 2012).

It is worth pointing out that not everybody plays games and therefore not everybody would be engaged and motivated in playing a game to learn from. They can be considered an effective additional method to enhance teaching and learning and are not about replacing existing techniques or teachers (Habgood and Ainsworth, 2011; Whitton, 2009 and 2010).

Games come in many guises for education and not all elements or components of games have to be used in order for the game to be effective (Whitton, 2009).

However, just as Whitton (2012), warns against Prensky's stealth learning, one should also be cautious of using this medium as a Trojan horse; one that does not deliver the experience of a game.

2.5.4 A need for the synergy of Games and Serious Games in Education

Most research effort has concentrated on the aspects of Game Based Learning theories, how it is used or concentrated on the empirical evidence or lack of. Others have concentrated on the aspects of applying learning frameworks to game development. Few studies exist for merging Game Based Learning Theories used in Serious Games to Game Design or for showing environment, tools and methods; it appears researchers' efforts concentrate overall on one side or the other of the two fields (Jovanovic et al, 2011).

Researchers have concentrated either, on the design of Serious Games from the viewpoint of educational pedagogy or instructional design or the design of videogames from the viewpoint of game design principles or video games as; there seems little effort to join the two fields together. Researchers for Serious Games for education by and large, either fail to mention the aspects of goals, challenges, narratives and if they are mentioned it is usually to do with the design of pedagogical outcomes rather than game design principles. Hence we get this disconnect of what is anticipated by students to what is actually produced, (Horstman, 2013). *"Motivational design is concerned with how to make instruction appealing without becoming purely entertaining."* (Keller, 2006) Horstman (2013), speculates that methods utilised to design educational games come from instructional design paradigm and that these do not often correlate to game design principles that exist or are used within the games industry, which is a valid point.

Porting educational pedagogy into games gives a disconnected game that fails to take full advantage of this medium, unless we design an educational game that integrates the right learning pedagogy and include it in a motivating and stimulating way (Breuer and Brente, 2010) and takes into account game design principles.

Often times the design of an educational game is heavily influenced by the learning content at the expense of the essence of the game's immersiveness and flow (Fabricatore, 2000).

An example of this is the study of Kebritchi et al (2010) as cited in Girard et al (2013). Girard et al (2013) chose this as one of the studies that met the criteria of being a Serious Games. However the game DimensionM that was cited in the study, though found in a virtual environment and with good gameplay stops to ask questions that are not relevant to the gameplay; it was interesting and no surprise then that Girard et al (2013), found there was no engagement. This type of game shows, the gap between the game and the educational content design and is an example of what Habgood and Ainsworth (2011), refer to as *"sugar coating"* the learning content.

If one is going to state that videogames motivate and engage then one has to use videogames concepts as a starting point. The military seem to have made the connection in their Serious Games efforts. We still seem to use the old style of games but use videogames as an example in the research; we often then work with examples of educational, CAL type of games or sometimes have the Serious but not the Game component.

There is therefore, a disconnect between the expectation of what well-designed entertainment games could deliver to players and what Serious Games often deliver in terms of design and implementation. There is also a divide between the understanding of design concepts in terms of a video game and that of an educational game.

There should be a distinction between Digital Game Based Learning types within the Serious Games domain; those that are considered as games (video games or other types) and those that are either in the category of educational learning tools, CALs, or computer simulations or educational applications.

There needs to be an understanding that different types of DGBL are useful for different purposes, content and context. A computer simulation for Science will always be more appropriate, if a graph is required to interpret data, as in Eckhardt's study shown in Fig. 2.4 from Section 2.5.1 (Eckhardt, 2012). However, if the premise is to discover how to find the source of an infectious disease, then an adventure style game like Crystal Island developed by North Carolina University as cited by Rowe et al (2009) or Quest Atlantis (cited in Barab et al, 2010) could be considered.

Many researchers take the view of Michael and Chen (as cited by Marsh, 2011), that games should educate first and that's its focus should be the primary goal. Zyda on the other hand argues that pedagogy must come after the story *"the entertainment component comes first. Once it's worked out, the pedagogy follows"* (Zyda, 2005).

Many of the games that exist do not meet the educators' requirements or have game elements hooked in to appease the gamer, neither of which are suitable (Klopfer, et al; 2009).

There should be more of an understanding of the principles of game design and its connection with the learning content; the two need to be seamlessly integrated.

2.6 Summary and Discussion

It has become apparent through the review of existing literature in the domain of Serious Games that, we need a way to speak the same language so that we can understand each other. At present Serious Games means different things to different people. This thesis considers DGBL from the viewpoint of it being an educational SG, to distinguish it from other types of SG but situates the DGBL within Marsh's interpretation of Serious Games.

We then need to look at what we are trying to achieve and for that maybe, we should as Sinek (2009) suggests start with the WHY. If we are trying to motivate disengaged students in order to spark an interest in the topic, to make them read and discuss the topic, then a game is suitable. If, however we are just trying to port our normal educational style of instructional design to a game with the hope that it will have the same effect, then we have lost the purpose of WHY; we should instead consider a learning tool in the form of some type of

gamification. This WHY will guide us to WHAT we design and then HOW we design.
Part of educational pedagogy is to ensure students know the purpose of what they are doing in other words the WHY. However in designing and considering GBL, we often fail to take this into account and start with WHAT or HOW.

My purpose is to see if it is possible to design and develop a video game that is suitable for both students and educators. It does not attempt to assess student learning through the game, it only attempts to see if they find that the gameplay has the essences of a commercial game, if they discover the learning elements as a seamless integration to the gameplay or see it as distinct from the game. It is a prototype that is intended to use the premise that most gamers play socially (even single player ones), that most players will seek additional help if stuck and that even if they know little about the subject, they will attempt to solve it in order to get to the next level. It is the basis of what could be expanded by intrinsically weaving educational content with gameplay. It does not pretend to answer all the questions but does attempt to show a way of including a puzzle without losing the essence of a game.

Therefore, I will first concentrate on the WHY, with a little bit of WHAT and a large dose of HOW.
The WHY is to be inspired, motivated and to learn. Not to be assessed, tested, attempting to change the learner behaviour to fit with our educational belief of what learning is or, to port classroom pedagogy into this medium. Neither is it just to entertain; it is about motivating and engaging a learner, it is about making them curious.
The WHAT is the medium of game and learning content intrinsically woven; the gameplay has to co-exist with the learning content. It is based on the content but not on just educational content.
The HOW is to ensure we use this medium to its full advantage without just porting our old method of instructional design to it, but also understanding that games themselves do not motivate and engage unless they are well designed. It is based on design but not on old methods; we need to take a leaf out of the game designers' book and a leaf out of the educationalist's book.

It is about listening to the experiences of students and hoping that what they experience in terms of content sparks their curiosity but also fulfils their expectation of what a game should be. It is also about changing educators' perceptions and leading them to see how this medium could be used in terms of content, context and purpose.
In order to fully utilise the potential of the medium, we need to challenge the assumptions that exist about games and also challenge our beliefs and practices in education and what we expect from this medium. We also need to understand the difference between designing for education, training and business just as game designers understand the difference between designing for different genres, audiences and types of gameplay such as casual or hard core.

As can be seen the words such as Game Based Learning and Serious Games have many connotations.

If our epistemological framework in this field of study is clouded by semantics, differences in language or different understanding of the concepts amongst ourselves and other experts in related fields. This raises a whole series of questions.

If we don't understand what each of us expects or interprets as a game, how can we design a suitable game that would be accepted by both students and educators?
If we just port educational pedagogy into a game, what have we actually achieved?
If we design games using only educational pedagogy and instructional design, what are we making?
If we take some design principles but then redefine these concepts to suit our own understanding through a pedagogical stance, have we achieved what we need to?
If we design educational games the same as training games, are we considering the different motivational aspects?

The aim of this thesis is to design and develop an educational game that is suitable for both educators and students alike.

With this in mind, this thesis follows the philosophy of Marsh's interpretation of Serious Games and endeavours to capture the essence of his definition of "entertainment games with a purpose", previously mentioned in section 2.5.2. It aims to encapsulate in its design and development, educational pedagogy with all the characteristics of games (Marsh, 2011).

"That is the way to learn the most, that when you are doing something with such enjoyment that you don't notice that the time passes." Albert Einstein

3 MOTIVATION AND SERIOUS GAMES

We seek to motivate and engage with a Serious Game. But what is it that motivates and engages players in games? Unless we understand that, we cannot hope to make use of all that this medium has to offer us. A starting point is that we need to play games (Egenfeldt-Nielsen et al, 2013), in order to understand aspects of playability, gameplay and what it is that makes this such an engaging medium for those that play. We cannot hope to understand unless we get an insight into the world of games. Simply adding good pedagogy will not have the same effect as ensuring that gameplay and good pedagogy is designed in equal measure. In order to do that, we need to understand, what it is that makes a game "Fun", what are the attributes that make "Flow", what players call "being in the zone" possible and how we can maintain that flow. What is that engages and motivates players?

This chapter covers aspects of motivation, fun and flow.
Section 1 is an introduction to the chapter.
Section 2 introduces us to motivation with an overview of the existing theories and concepts within this domain. Section 3 discusses aspects of Self-Determination Theory and considers its opponents and proponents
Section 4 considers different aspects of motivation in light of Serious Games
Section 5 introduces us to the concept of fun and flow
Section 6 situates emotion and affective states with the realms of motivational through aspects of educational pedagogy.
Section 7 brings the salient points in the final discussion

3.1 Introduction

One of the main considerations for using Game Based Learning is to motivate and engage students in their learning (Iacovides, 2012, Habgood et al, 2005a).
Though Whitton (2010) puts forward the argument, that the value of games are not so much in their motivational value but in the sound educational principles they can impart and their ability to engage.
Nevertheless, only concentrating on sound educational principles, without understanding the aspects that motivate players to play for leisure means that there is a danger that one could lose the aspect of what enables this medium to be motivating and engaging in the first place.
Students on the whole, find educational games that may be considered as having good purposeful learning often as a boring experience (Kirriemuir & McFarlane 2004; Klopfer et al, 2009; Appelman, 2007). Though some say that the educational games should be fun as well as have relevant learning content (Koster), others feel that the aim of serious games is to produce purposeful learning (Appelman, 2007) and the focus should be on engagement rather than just the fun (Appelman, 2007; Whitton, 2012). Appelman proposed 3 important aspects that needed to be found in an educational game before it could be considered a serious game or effective as an educational one; Serious Content, Serious Outcome and Serious Players.
Deleting the aspects that make a game fun, would result in a boring game, just as concentrating only on the fun aspects would not be a serious game. “Motivational design is concerned with how to make instruction appealing without becoming purely entertaining” (Keller, 2006).

3.2 Motivation

The study of human motivation on why, when and how we are motivated to take certain actions has been with us a millennia; belonging initially to the realms of Philosophers to be transmitted to the realms of Psychology, Business and Education.

Though this thesis is not concerned with testing learning, it is important to understand what aspects motivate and engage players to play games and keep them engaged; this understanding can then be best applied to facilitate learning aspects. For after all it is this that we hope to emulate; we need to understand what aspects actually makes people want to play games before we can apply it to Serious Games. Until we understand how to build an integrated game that includes learning and gameplay, we cannot proceed to test learning; if we do not understand motivation in respect of gameplay and learning, we cannot achieve our aim.

3.2.1 Overview of motivation

Motivational theories can be looked at from different perspectives; either that of Content or Process and from the perspective of Organismic or Mechanistic. The Content perspective is concerned with what motivates people in terms of needs and goals and belongs to the domain of such theorists as Maslow, Alderfer, Herzberg and McClelland. Whereas the Process theories, whose proponents are Vroom, Porter & Lawler, Adams and Locke, take the perspective of how motivation occurs.

Amongst the most well-known proponents of Mechanistic theories, are Freud (Instinct theory) and Hull (Drive theory) and those who considered that we are motivated to act mechanistically to fulfill our basic needs. Whereas Organismic are those who follow the theory that we are a living organism and therefore we don't just act mechanically and are influenced by our surroundings and our needs (White, 1959; Deci and Ryan, 1985; Weiner, 2012, 1985).

Ryan and Deci (1985) describe Mechanistic as passive ("pushed around by the interaction of psychological drives and environmental stimuli") and Organismic as Active (Volitional and initiating behaviour).

Maslow's hierarchy of needs is a well-known concept amongst educators; starting with Physiological and ending with Self-actualization at the top of the pyramid.

Though his original paper of 1943 included no pyramid, his hierarchy of needs is always depicted in a pyramid. According to his theory, once a need is satisfied we move on to strive for the next, with self-actualization meaning that we have reached our full potential. This was then simplified to three by Alderfer; merging some of the categories and was known as the ERG theory. Physiological and safety were merged to form the Existence needs and Belonging was named as the Relatedness needs and Esteem and Self-actualization were merged to be known as the Growth needs.

Herzberg, who introduced Hygiene factors and Motivators, suggested the Two Factor theory. He proposed that Hygiene factors were extrinsic motivators such as salary and job satisfaction, whereas the Motivators were intrinsic and covered such aspects as achievement, responsibility and personal growth; in short the Hygiene determines dissatisfaction and the Motivator determine satisfaction.

Semantics apart, this really leads us to the concept of intrinsic and extrinsic motivation aspects that has been of interest to educators, instructional designers and the business world from the world of Organismic motivational theories. But before we consider intrinsic and extrinsic motivation, it is worth spending a little time on the background on the theories of motivation from the perspective of Weiner, Deci and Ryan and White.

According to Weiner (2012), motivation is more than just reducing internal tension and returning to balance or that we are simply motivated by hedonism where we seek to increase pleasure and decrease pain, as in the Hull's drive or Freud's instinct theories of human motivation. He felt this could not possibly account for all of our actions and that we also have a need to understand ourselves and our environment. He also proposed that Motivation is also dependent on other cognitive factors other than just goal attainment. He felt that most theories failed to consider other important aspects that influence behaviour. The fact that we experience, think and feel are factors to be taken into account when considering motivation, *"….that organism act on a perceived rather than an objective, world"*, (Lewin 1935, as cited by Weiner). He states that any theory on motivation must also take into account the Self, as our actions are often motivated in order to sustain or enhance our self-esteem and

as individuals, we experience a diversity of complex emotions which need to be taken into account (Weiner, 1985, 2012).

White was one of the first to propose Effectance motivation related to Competence (1959). He further advocates that this Competence motivation is different to the other biological factors of motivation such as hunger or thirst. He theorised that a motivation such as competence did not fit in with Hull's Drive theory or with Freud's Instinct theory and stated that mammals, but especially man only becomes adept at interacting with the environment from extended acts of learning (White, 1959). He situates Effectance as the motivational aspect of Competence as the urge that manifests when we are *"either unoccupied or gently stimulated by the environment"*, (White, p321) and the need to achieve or attain Competence is sustained by the persistence, selection and directness of this behaviour that he terms as Effectance.

Though White situated his research within the realms of young children and their competency in relation to interaction with the environment; where this interaction through active exploratory and experimental manner helps them achieve competence. He states that that this directed, selective and persistent behaviour in interacting with their environment by constantly testing and responding to the stimulus shows that a child is motivated.

This then enables the cumulative learning necessary to the initial autonomy required to progress towards gaining achievement of competence.

However, he also suggests that effectance motivation can exist in order to pursue activities such as exploration and adventure that is of interest, even when there is no longer any gain in competency or need of it in terms of survival; simply for its own sake.

The satisfaction gained from the activity or behaviours in those activities, as well as maintaining that interest is not a simple transaction. White felt that naming it as feeling of efficacy was more apt than just satisfaction, as these activities often involved many transactions that involved stimulus, response, perception and effect all involved continuous action and change rather than the single stimulus-response of a single transaction.

He expands this by stating that effectance motivation would decrease when the activity or situation either no longer presents new possibilities or lacks variation.

Though self-determination is often linked to Ryan and Deci, the word though not necessarily the full meaning was first coined by Angyal in 1941, where White in his 1959 seminal work cites, "*We may say," Angyal writes, "that the general dynamic trend of the organism is toward an increase of autonomy.... The human being has a characteristic tendency toward self-determination, that is, a tendency to resist external influences and to subordinate the heteronomous forces of the physical and social environment to its own sphere of influence"* (As cited in White, 1959).

Deci and Ryan (1985), consider that psychological theories can only be considered motivational theories, if they *include "energisation and direction of behaviour"* (1985, p3). They consider this energisation to be twofold, the needs that are innate to an organism in order to remain healthy and those from the interaction of the environment. They suggest that the direction is the process and structure that directs the organism to the satisfaction of the needs. This view is organismic rather than the pure drive theory, which was mechanistic. Basically, this non-drive motivation is the intrinsic motivation. There seems to be a consensus that this intrinsic motivation is based on the needs to be competent and self-determining. According to Deci and Ryan, the works of such people as deCharms, Heider and White, have influenced their theory of self-determination. However they do state, that though their theory has been influenced by prior developments, their theory is motivational rather than cognitive, as these motivational constructs organise behavioural, affective and cognitive constructs as well as addressing energisation and direction of behaviour. They also declare that it differs from White as he made competence as the "backbone of intrinsic motivation", whereas they felt that it was the need for self-determined competence rather than just competence. This self-determination, they feel requires the experience of an internal perceived locus of causality. Deci and Ryan, state that self-determination although not the same as Maslow's self-actualization emphasizes the importance of choice and that though it often

involved the control of one's environment or outcomes but could involve choosing to give up control (Deci and Ryan, 1985, p38).

A distinction can be made here, in that the perceived locus of causality in Weiner's attribution theory concentrates on how one perceives the success or failure of a task and the attribution of this success or failure due to either their own effort or external factors such as luck. Whereas the self-determination theory concentrates its efforts on the aspect of choice and whether the influence of undertaking something was voluntary or was influenced by external factors or even internal pressures that forced to undertake the task in the first place.

3.3 Self-Determination Theory

The self-determination theory of Deci and Ryan, (1985) is based on the premise that different types of motivation exist and that these are dependent on different reasons or goals that will result in an action. They distinguish between two types of motivation; extrinsic and intrinsic. In their classification they also include Amotivation; when a person is not motivated to act or a *"state of lacking the intention to act"* (Deci and Ryan, 2000).

Intrinsic motivation is doing something for the sake of doing it as one obtains enjoyment from it without exterior reward, whereas extrinsic motivation is governed by external rewards such as money and grades etc.

They advanced the idea that Competence, Autonomy and Relatedness were the basic Psychological needs that are satisfied by intrinsically motivated behaviours (Deci and Ryan, 2000).

Reiss (2004) however disagrees that one can put human motivation into just two distinct groups and feels that people are motivated by different factors and that receiving rewards in order to be motivated is no more inferior then other ways. He feels that people are different and different things motivate them and make them happy. He mentions 16 basic desires/motives that motivate our behaviour and define our personality and considers intrinsic motivation as multifaceted.

Influenced by the work of those such as Deci, Pink (2009), conveyed the aspect of motivation to the world of business. Whereas Deci and Ryan used the term Autonomy, Competence and Relatedness, Pink uses the terms Autonomy, Mastery and Purpose which relates more to business concepts. He states that intrinsic behaviour needs these three nutrients, Autonomy, Mastery and Purpose.

He refers to behaviours that are fuelled less by intrinsic and more by extrinsic behaviours and is concerned with external rewards as Type X (Extrinsic) and Intrinsic as Type I. The Type I behaviour manifests itself when one has Autonomy over their Tasks, Time, Technique and Team. He suggests that Mastery is the desire to improve and get better at something that matters and notes that Deci (as cited by Pink, 2009) found that the addition of certain kinds of extrinsic reward on initially intrinsically rewarding tasks, can dampen motivation and affect performance.

He defines three laws of Mastery as being, a Mind-set, it is a Pain and it is Asymptote.

His third, Purpose provides a context for the other two, he further proposes that the higher the Purpose (in that the cause is a worthy one, one that is larger than oneself), the more motivated one is.

Pink (2009) eloquently cites Wikipedia as an example of intrinsic motivation that drives people to give their time without monetary rewards, just as the modding community is another one. He proposes that Autonomy, Mastery and Purpose are the most important aspects in considering motivation.

3.4 Motivational consideration for instructional game design

Here we return to Deci and Ryan's concepts and explore further elements that are applicable to instructional design and games in relation to motivational theory.

Deci and Ryan describe Autonomy within Self Determination Theory as " a sense of volition or willingness when doing a task" (Deci and Ryan 2000). It is

this choice that gives one the feeling of being in control; as soon as it is felt the person is no longer in control then the intrinsic motivation diminishes as they no longer enjoy the task. Therefore perceived Autonomy is high when a person either does a task they enjoy, are interested in or one that is of personal value to them. Ryan et al (2006) state that events and conditions that are non-controlling (feedback, choice and non-controlling instructions) enhance autonomy and in turn intrinsic motivation. The opposite is also true; controlling events and conditions would have a detrimental effect on their perceived autonomy and thus diminish intrinsic motivation.

In games play is voluntary (or should be), this initially gives the sense of autonomy (but obviously not for educational games that are set by educators). In this instance we have extrinsic motivation and if designed properly, the game itself should give the player a sense of autonomy. (However, this is not always the case as educators are used to control and if the game is designed that way, you lose the sense of autonomy that you wish to impart to the player).

Deci and Ryan confirm this view point that games can further provide the autonomy within its design (Deci et al, 2006).

They hypothesised that perceived competence was amongst the most important satisfaction provided by games. They state that perceived competence would be enhanced if the controls are mastered easily and are intuitive, there was positive feedback and there was on-going “optimal” challenge. This ability to acquire new skills or abilities together with opportunity of receiving positive feedback on one’s actions, added to the on-going challenge is what enhanced a person’s perceived competence, culminating in enhanced intrinsic motivation.

In addition to Autonomy and Competence, they also state that intrinsic motivation is influenced by presence, intuitive controls and relatedness (Deci and Ryan, 2006).

Competence is the sense of mastery, of growing, of learning, of advancing and of finally achieving. Though one has to concede that though we can strive for Mastery but we can never truly achieve for it is, as Pink described it Asymptote (Pink, 2009). Autonomy is the sense of some form of control, either through the environment they visit or the choices they are allowed to make within the game; though these choices have to be meaningful, either that it actually has an

impact or that the player felt it made a difference. Relatedness is the need to fulfil that we matter and that we can contribute somehow.

Denis and Jouvelot (2005) combine and extend the intrinsic motivation to encompass Arousal and Control as well as Flow and look at motivation through the impact of Challenge and Skills and view Fun as highly motivating learning aspect. They consider Fun as Pleasure and Desire and its resulting Ludic Tension.

"The essence of fun is a ludic tension that conveys the permanent evolution of one's own pleasure, desire and abilities." (Denis and Jouvelot, 2005)

According to Malone (1980), the difference between intrinsic and extrinsic can depend on a person's interpretation.

Malone stated that it is not as easy to distinguish between intrinsic and extrinsic motivation. He states that one cannot be sure of a person's interior motive and maybe this ought to be left for the individual to decide.

Intrinsic motivation is when one is motivated by the activity for its own sake rather than an external reward, whereas extrinsic motivation is an activity undertaken for an external reward.

Malone and Lepper described four individual motivating factors:

- Challenge
- Curiosity
- Control
- Fantasy

Malone and Lepper described three interpersonal motivating factors:

- Cooperation
- Competition
- Recognition

Malone came to the conclusion that Challenge, Fantasy and Curiosity were elements that formed the characteristics of intrinsically motivating environments he did this in order to *"guide the design of computer-based instructional environments."*

He breaks up curiosity into various types. For instance one could say that a person is curious about something because of the novelty factor, or curious to see if they can complete/master something. (Though I would imagine they would have to be curious enough to try and engage with that element first).

Malone and Lepper (1987), mention the importance of endogenous (integration) and exogenous.
They propose that if it is intrinsically motivating and also endogenous then the effect would *"frequently produce*

a) *Higher level of sustained interest in the activity or the instructional content of the activity in future situations*
b) *Better learning of that instructional content"*

Even when the learning activity itself is not intrinsically motivated they felt instructional environments could be improved. Control was added to Malone's initial individual motivational factors.
They state that a number of theorists have explained intrinsic motivation primarily from different points of view, such as White's 1959 and Csikszentmihalyi's 1975 view of Competence and Challenge, to concepts such as control and self-determination by authors such as Deci 1975 amongst others (Condry, 1977; de Charms, 1968 as cited by Malone and Lepper, 1987). Other views mentioned were those of optimal levels of arousal or stimulation by such authors as (Berlyne 1960, 1966 and Piaget, 1952). They propose that rather than these being looked upon as contradictory; they should be considered together in a common framework (Malone and Lepper, 1987).
They further suggest that we seek and enjoy activities that offer us Challenge (which others have agreed on), they postulate that though many different terms have been used with this concept, (flow, effectance, perceived competence or self-efficacy), they all agree that "people prefer an *optimal level of challenge*". More than that, they also advance the idea that in order for the activity to be challenging, the goal's outcome must be uncertain and that it must be accompanied by feedback of the goal's status of achievement/attainment. This follows Csikszentmihalyi's optimal flow.

Within the aspect of goals of the activity, they mention fixed and Csikszentmihalyi's emergent goal. They also consider Bandura and Schunk's proximal goals and suggest that a form of hierarchical type of goal system that includes both proximal and distal would enhance motivation. They emphasise that uncertain outcome of the challenge is paramount; this does make sense as if you know you can do something easily it does not test your skill and as Csikszentmihalyi's states you go towards boredom, if on the other hand the goal is too difficult to achieve, then you would get frustrated and not bother. This kind of balance of challenge is used optimally in a well- designed computer game.

Malone and Lepper (1987), include some elements that are used in games and suggest that these should be considered when designing instructional ones.
They suggest considering variable difficulty levels, multiple level of goals, hidden information and randomness.
They also feel that the *performance goals* should be relevant in terms of either Instrumental, fantasy or social. By that they mean that it either needs to be in a world/environment that is appealing or meaningful

3.5 What is fun or flow?

It is worth returning here to focus on the premise that serious games for education should be engaging and not necessarily fun. Two points need to be mentioned, engagement does not necessarily mean that learning has taken place and that maintaining engagement in games is the cornerstone of the game industry and it relies on the concept of fun. It seems appropriate to go into a little detail about flow and fun, though other aspects found in games will be discussed in subsequent chapters this seems an ideal opportunity to introduce the concepts of fun and flow to those who are not familiar with this concept within the context of games.

3.5.1 Fun

One must also not forget what games are about, they are about fun (Kremers, 2009; Koster, 2005) and it is this fun that is believed to bring about the motivation and engagement that we seek to capitalise on, (Zheng, Spires and Meluso, 2011). Gamers often talk about a game being fun. This aspect seems to worry educators, fun means enjoyment rather than engagement and it means play and not learning.
The idea of Fun in a game is a hotly debated topic when it comes to educational games; but what actually is fun?

Juul (2011) states there is no one word definition for what makes games fun, rather different games are fun for different reasons. Some say it is the gameplay and that *"high quality games are the ones whose choices provide high-quality mental challenges"* (Juul, P18), however many games do not provide high quality mental challenges, so different players find different types of games fun. Denis and Jouvelot (2005) state that fun in video games is the motivational factor and organised the fun factors within the two poles of Pleasure and Desire and their resulting Ludic Tension.
Lazzaro on the other hand describes 4 types of fun, (Lazzaro, 2004).

- Hard Fun
    - Those that want a challenge and to test their skills
- Easy Fun
    - To experience something new and enjoy curiosity and intrigue
- Altered States
    - Concerned with internal feelings and to think or feel something different. Excitement or Relief from thoughts or feelings
- People Factor
    - To experience social interaction

Garneau (2001) suggests that though one may never know what the true nature of fun is and why some things are fun but others are not, he came up with 14 forms of fun that would help us answer what makes a game fun. These are

Beauty, Immersion, Intellectual Problem Solving, Competition, social Interaction, Comedy, Thrill of danger, Physical Activity, Love, Creation, Power, Discovery, Advancement and Completion and Application of an Ability.
Schell's (2008) interpretation of fun is that though pleasure is part of fun, fun is not simply pleasure but has a certain *"sparkle"* and a certain *"excitement"* to it. He decides that *"Fun is pleasure with surprises"* and further concludes that fun is a desirable aspect to most games, he does concede that certain types of games that are social type of games (games for change), don't have fun.

According to Ulicsak (2010), Serious Games need to be engaging but not necessarily fun and further adds that the learning outcome in SG is dependent on appropriate pedagogy with the content integrated to the game so *"learning is intrinsic to play".* Most people associate play with fun but in this instance it probably refers to the act of play within the game (Ulicsak, 2010).
So it appears that fun is interpreted as different things and different ways to different people and Schell (2008), states Fun defies analysis. One could conclude that the same principle applies to Fun as to Games *"For if you look at them, you will not see something that is common to all, but similarities, relationships and a whole series of them at that"* (Wittgenstein, 1963); for it is a mixture of Lazzaro, Denis and Jouvelot, Garneau, Koster and Schell's definition and infinitely more. It may defy description but we know it when we experience it and it manifests itself in different forms for each of us. But if one takes a closer look one can also see similarities between the above definitions and those of Caillois as previously mentioned in section 2.1.4, when he categorized games as having the following characteristics, Agon (competitive in nature), Alea (Chance rather than skill), Mimicry (roles and suspension of reality) and Llinx (Adrenaline rush).
So one can see why Games are inexorably linked to Fun.
I like to think of Fun as the feedback to the experience, an emotion we seek to invoke, whether it is our wish to invoke the experience of novelty through exploration or learning something new, of challenge or competition in order to test our skill or escape our reality for a while. If the experience is good then we tend to define the activity as fun. (We seek experience or need to escape experience; positive experience is when we manage to achieve that elusive fun)

Fun should not be considered a trivial pursuit, though of course the activity could be trivial; the result is more than mere play, the result is often a need to improve, to feel part of something, to better ourselves to test ourselves, to gain confidence. Fun is not just about pleasure, desire, enjoyment or play; I enjoy an ice-cream but I would not be able to describe eating it, always as a fun experience.

Fun in an activity is probably simply stated as when the activity fulfils certain needs, affirms certain emotions or feelings, the experience one feels is then fun. Fun is the feedback one receives if one fulfils or achieves some form of positive experience that stimulates our senses either through, Agon (competition with ourselves or others, problem solving), Alea (Chance rather than skill), Mimicry (roles and suspension of reality) and Llinx (Adrenaline rush).

Adams (2008), considers Fun to be a too limited a concept and even considers enjoyment too restrictive, a view shared by many but the most eloquently phrased description is by Sylvester who stated that using only fun to describe a game as *"It would be like a chef describing every dish as either "tasty" or "tasteless."* (Sylvester, 2013)

3.5.2 Flow

In his Flow: the psychology of optimal experience (1990), Csikszentmihalyi studied various people from afar as Japan, Australia, USA, as well as a Navajo reservation and Europe in the pursuit of ascertaining what makes us happy; what is it that gives us such enjoyment and fulfilment that culminates in the optimal experience that he calls flow.

Csikszentmihalyi's research was based on optimal enjoyment of life, during which he used the term flow to describe this optimal experience that one seeks in the pursuit of happiness. Though his study was about life in general, this concept of optimal flow has now become synonymous with research in this field in relation to motivational aspects in games and serious games research; the holy grail of designing games is about achieving the state of flow. Though both sides agree that this is an important aspect, the games industry have long

understood the concept of ensuring the balance between challenge and frustration.

The concept of flow, being in the zone is one that gamers often refer to, it is however interesting to note that Csikszentmihalyi and LeFevre, found that the great majority of flowlike experience came from experiences in the lives of average adults seem to come from work rather than leisure (Csikszentmihalyi and LeFevre,1989). They found that in leisure, driving gave the greatest amount of flow like experience and next to that was simply talking to friends and family.
Though the terms 'Flow', 'Flow state', 'Optimal flow' or being ' in the zone' is often associated with games, the original concept researched and introduced by Csikszentmihalyi was to ascertain how and what circumstances enabled that feeling of optimal experience, that experience and absorption that people felt when they experienced that feeling of deep concentration and enjoyment that has become known simply as Flow.
Though the concept has always existed and interpreted in different ways, he was the first to name it and this flow state is an optimal state relating to intrinsic motivation.
Flow theory and flow research originated with wanting to understand the intrinsically motivated or autotelic activities (goal for the self) which were quite apart from the end product or extrinsic reward (Nakamura, Csikszentmihalyi, 2002). They commented, that though research in intrinsic motivation had been conducted and summarised by Ryan and Deci in 1985, there was little empirical research to *"clarify the subjective phenomenology of intrinsic motivated activity"*
Csikszentmihalyi had investigated the conditions of enjoyment (1975-2000).
According to Nakumara and Csikszentmihalyi, the work on flow was assimilated into Psychology within the humanistic philosophy and also included as part of literature on intrinsic motivation by such researchers as Deci and Ryan in 1985.

They stated that though researchers concentrated on the main on play and games and activities that could naturally foster intrinsic motivation, research was also conducted on activities of work; specifically surgery. They found that the general characteristics found in optimal experience, was similar across play

and work. Nakumara and Csikszentmihalyi found that the conditions of flow included the following:

- Perceived challenges or opportunities that matched existing skills. These have to be not too hard or too easy
- Clear goals and immediate feedback of the action taken. To know if they were successful or not and if any progress has been made

The findings from the interviewees indicated that they were in the “flow”, as long as they were experiencing what they termed as just about manageable challenges as a series of goals, that offered feedback that enabled them to adjust their actions.
Under these conditions the following occurred:

- Intense and focused concentration on the activity
- Merging of action and awareness
- Loss of self- consciousness
- A sense of control and one could respond and deal with whatever would happen next
- Altered sense of time (time seems to pass faster)
- Doing an activity for its own sake and finding it intrinsically rewarding

(Nakumara and Csikszentmihalyi, 2002).

His study showed that this type of being in the zone or experiencing optimal flow, was felt across many different types of activities; from playing chess, or a video game to participating in the tour de France or running a marathon. Not only was this experienced with different types of activities, Csikszentmihalyi also found that regardless of gender, class, age or race, this enjoyment was experienced in much the same way by all and that they all experienced one or all of the eight/nine common factors (Csikszentmihalyi, 1990).

The main premise is that in order to achieve a state of flow there is a balance between the challenge of the task and the skill of the person. The skill level and the challenge must match; if the skill level is too low for the challenge then frustration will occur, if the skill level is too high for the challenge then boredom

will occur. This enables one to operate in full capacity (de Charms, 1968; Deci, 1975; White, 1959 as cited by Nakumara and Csikszentmihalyi, 2002).

Flow incorporates the following dimensions (Csikszentmihalyi, 1990; Faiola et al, 2013), (1) Clear Goals, (2) Immediate Feedback, (3) Balance between skills and challenges, (4) Loss of self-consciousness, (5) Altered Sense of time, (6) Deepening of Concentration, (7) Sense of Control, (8) Loss of ego and (9) Doing an activity for its own sake.

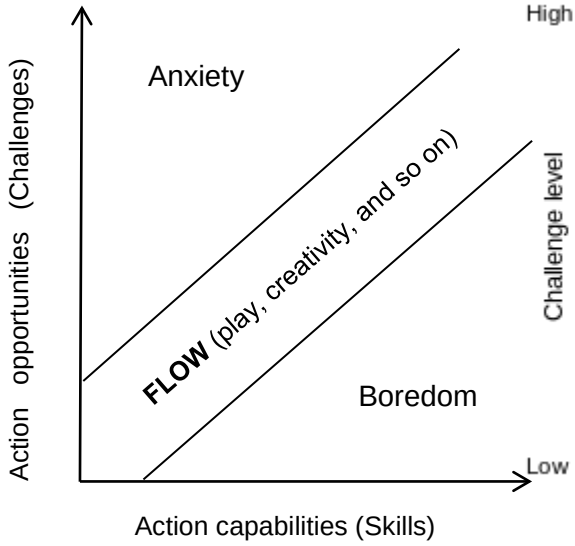


Fig. 3.1: Csikszentmihalyi's original model of Flow State

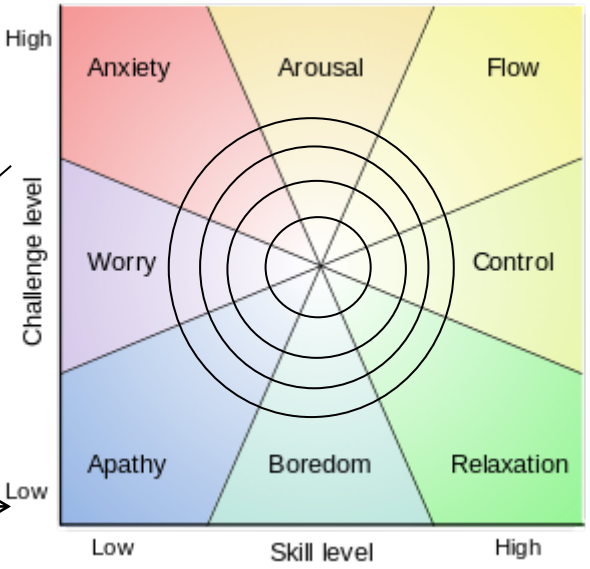


Fig. 3.2: Csikszentmihalyi's current model of Flow State (Creative Commons Licence)

Csikszentmihalyi's original model of 1975 of Flow State of Figure 3.1 showed Anxiety and Boredom within the Challenges and Skills and showing that when the Skill is matched to the Challenge, Optimal Flow is achieved. The current model of Figure 3.2 adapted from the original, 1997, shows eight channels; the concentric rings denote the intensity of the experience, though most researchers tend to focus on the outer rings (Nakumara and Csikszentmihalyi, 2002).

Well-designed games ensure that the player is kept in a state of flow, and as Prensky (2001) states, this is one of the biggest challenges of designing

educational games; to keep the player in a state of flow in such a game (Prensky, 2001).

Nakumara and Csikszentmihalyi, (2002), observed that possessing skills and interest in the activity is one precondition for finding flow. They also noted that if flow is found in a previously unengaging activity, thus becoming intrinsically motivating.

They also proposed the concept of emergent motivation whereby one can experience a previously unengaging activity as intrinsically motivating if one can find the flow in it. It is this that we are trying to achieve in using games for education, to motivate and engage; to enable this intrinsic motivation for a subject through a medium that some find intrinsically rewarding.

3.6 Emotion in the realms of Educational Pedagogy

Behaviourist and Cognitive learning theories are focused with the internal Psychological processes of elaboration and acquisition, whereas the modern Social learning theories usually focus solely on the external interactions between the learner and the environment. According to Illeris (2009), these two processes are usually considered separately in many learning theories and he suggests that both processes need to be considered if any learning is to take place. He further adds that these processes together with 3 dimensions of learning, namely that of Content, Incentive and Interaction need to be included when considering learning theories.

In his model, Illeris situates the External Interaction process between the Individual and Environment and the Psychological Acquisition process between the Content and Incentive.

Figure 3.3 shows the fundamental process of learning within the 3 dimensions.

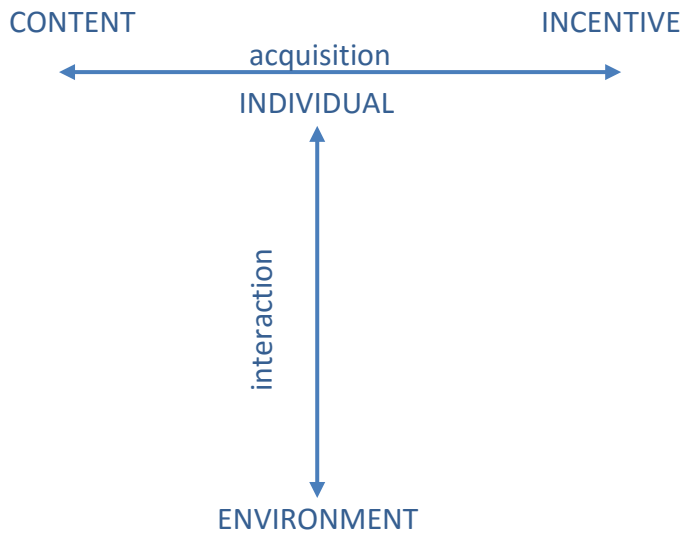


Fig. 3.3: Illeris's Fundamental processes of Learning

The Content dimension is the learning content, which become skills and knowledge amongst other things such as beliefs and opinions etc. and Illeris states that this dimension is "obsessed" with the type of incentives, (voluntary, compulsory, interest) from the Incentive dimension and the Incentive dimension in turn is influenced by the Content. This interdependency manifests itself in the psychological Acquisition.

The Incentive dimension is concerned with such things as feelings, emotion, motivation and volition and is concerned with how the learning is driven (voluntary, compulsory, interest), what motivates the learning process to take place and is also the motivation needed to provide the mental energy to enable the learning. Depending on the Content, the Incentive dimension is also influenced; if the new information is interesting to the learner then the Incentive would improve. The interaction between the Content and Incentive can be considered to be in the domain of Cognitive; where the Content is concerned with obtaining *meaning* and *ability* for the learner and the Incentive is concerned with achieving the mental balance. Illeris further states that an overall personal *functionality* is developed in the Content dimension and personal *sensitivity* in the Incentive dimension.

The two dimensions are initially started by the interaction process between the Individual and the Environment and then integrated in the internal process of acquisition. The Interaction dimension would be initiated by such aspects as

activities, experiences, participation etc. (Illeris, 2009). As Illeris states, the Interaction dimension enables the personal *integration* in the communities, thus building up the *sociality* of the learner but is dependent on the other two dimensions for this to take place. The general components that Illeris terms as competencies depicted in figure 3.4 show the importance of the interrelation between the Functionality, Sensitivity and the Sociality, that enable learning events or processes to take place.

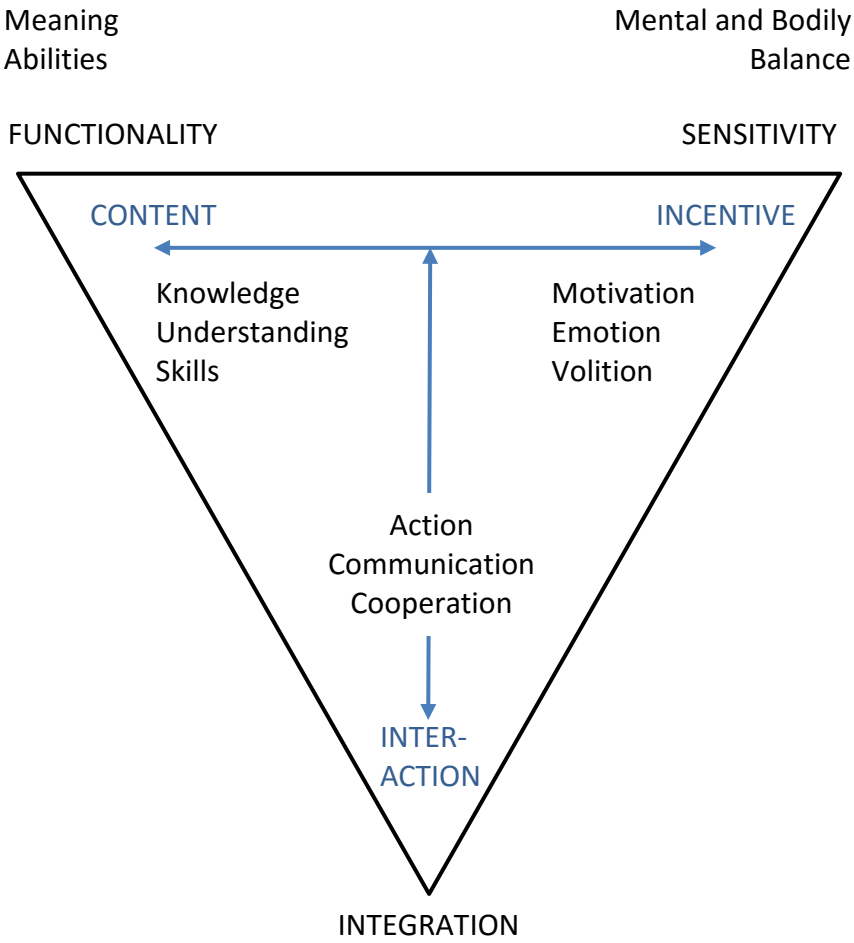


Fig. 3.4: Illeris's three dimensions of learning and competence development

His integrated learning model takes into account internal psychological processes (the influence between the content and the incentive for the mental energy to run the process), as well as the personal situation of the individual, the external factors and the resultant learning. This combines aspects of social and situational as well as cognitive theories.

This interaction between Cognitive and Emotional is one that according to Illeris, psychologists have been aware of (he mentions Vygotsky and Furth), though Bruner points out that it is often said that cognitive psychology neglects the place of emotion and feeling in relation to the life of the mind. It is therefore worth citing Bruner who succinctly puts the point across *"Surely emotions and feelings are represented in the process of meaning making and in our construction of reality"* (Bruner, 2009, p167).

Kolb's Learning Cycle is one that educators are familiar with and his experiential learning circle that involves, Concrete Experience followed by Reflective Observation of the experience followed by Abstract Conceptualization and finally Active experimentation where the learner applies it.
Kolb defines learning as: 'Learning is the process whereby knowledge is created through the transformation of experience' (Kolb, 1984: 38 as cited by Elkjaer, 2009). However as Elkjaer points out, Kolb's experiential learning cycle could be considered as separate stages rather than Dewey's concept of experience and that Kolb's has no place for emotion or aesthetics.

Dewey's experience definition is less situated in just the aspect of knowledge and is more about the lives and living; the experience of living and the interaction between individuals and their environments. This interaction enables the experiences that encompass emotion, aesthetics, ethics as well as knowledge (Elkjaer, 2009).

3.6.1 Affective States

According to Kort et al (2001), learners often fail to experience the natural association of failure and learning due to most of the material being presented in such a form that it neglects the natural steps of making mistakes; including the recovery, analysis and starting over. This lack of experience of undergoing failure results in the misattribution of their failure rather than understanding that this is a natural process and a helpful part of learning. They consider that this

results in learners believing that they are stupid or just cannot grasp the subject, because we fail to teach them that these feelings associated with failure are a normal part of learning. This interplay between emotion and learning that they address is one that games capitalise on, where a good game facilitates the balance between skill and challenge in order to achieve good gameplay and the Csikszentmihalyi (1990) 'Zone of Flow'. Games offer an almost immediate channel of emotional arousal thus providing a means of affecting the mood and emotional states (Calleja, 2007). However, the same experience of failure that Kort et al mention is not received the same way when playing a game. Players will go through the natural steps of associated affective responses to failure and in most cases see it as a challenge and as part of the gameplay to overcome the challenges faced.

The model of affective state of Figure 3.5 that Kort et al proposed shows the emotional axes with cognitive dynamics of the learning process.

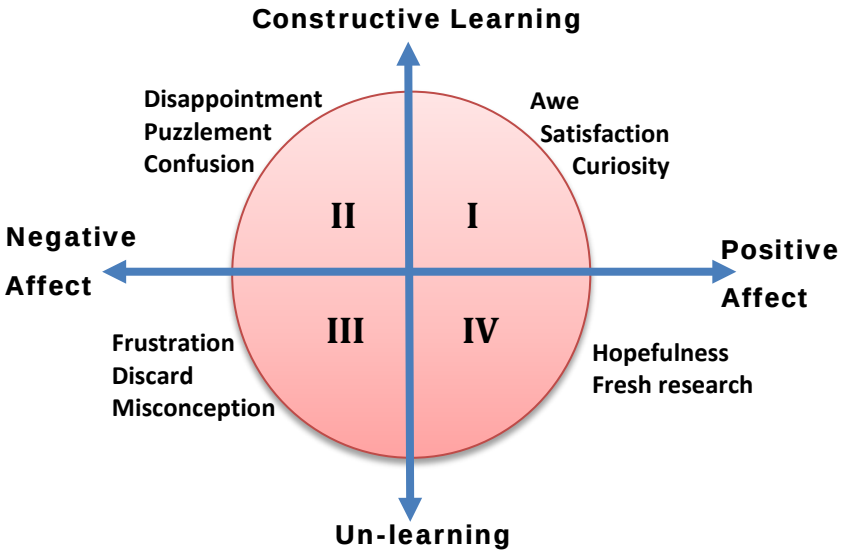


Fig. 3.5: Kort et al's model representing phases of learning to emotions.

According to Kort et al (2001), the four most common emotions that appear by most theorists in the field of emotions are fear, anger, sadness and joy. One of the main aspects of game design is to elicit experience and emotion from a player, discussed in Chapter 4 section.5.1. Emotions through facial expressions

are also used on NPC to give a sense of a living world and a form of immersiveness.

In his discussion of the OCC (Ortony, Clone & Collins, 1988), model of emotion synthesis, Bartneck (2002) suggests six main emotions, and these are applied to modelling emotions in embodied characters and are often used to show types of emotions through facial expression shown by NPC. These are Smile, Anger, Sadness, Disgust and Fear. Though Surprise is included in one of the main emotions, it is not included as it does not map to emotion in the OCC model. The Five Factor Model (FFM) is one often associated with emotion and personality trait, though in the realms of Psychology, it has also been used to understand motivation of player and player types/ preference in games. They are referred to as the big five and include the following: Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism. Each of these includes 6 facets within each domain and are considered from one end of a continuum to the other.

This together with OCC are used to model virtual characters in realms of Psychology (Romano et al, 2005) but the FFM has also been used from diverse field such as educational Psychology (von Stumm et al, 2011) to Game Design. Vandenberghe, (2012) a creative designer for Ubisoft Montreal, refers to them as O.C.E.A.N. He has mapped these to the 5 domains of play, using Novelty, Challenge, Stimulation, Harmony, and Threat as metaphors and placing each of these on a continuum.

The attribution of emotional states of an NPC may not be the same as that of players/students; however, the technique of using state transition diagrams that are often used to portray AI states has been used. Table 3.1, figure 3.6 and figure 3.7 show the affective states of Kort et al that could occur in a student seen from a positive frame. The revised states include additional elements, including Keller's ARCS model, which includes Attention, Relevance, Confidence and Satisfaction (Keller, 1987).

This technique seemed more appropriate for highlighting Kort's triggers and affective states.

A take on Affective State of minds for Students

States: Confusion, Engagement, Frustration, Boredom, Anxiety, Fear, Happiness, Pride, Confidence, Eureka (understanding, light bulb).

Components: Valence ((negative/positive) POSITIVE AND NEGATIVE EMOTIONS) and Arousal ((Activation/Deactivation) Learning/not Learning)

Interpretation: (light bulb, when they get something), (wander state, when they are distracted), (ARCS, Attention, Relevance, Confidence and Satisfaction). (flow, challenge and frustration)

Important: (emotion, motivation, subject, way it is delivered, level and complexity, fairness, understanding what is required, individual skill level and aptitude, in context of student (interest, culture etc.)). Pace matters too fast, you lose them, too slow you lose them, just the right pace.

STATES	**TRANSITIONS:** (something is…in this case student)			
	Learning/ Positive	Learning/ Negative	Not Learning/ Negative	Not Learning/ Positive
Engagement	In Zone			Engagement
Confusion		Confusion		
Anxiety		Anxiety		Anxiety
Boredom		Boredom	Boredom	
Curiosity	Curiosity			Curiosity
Frustration		Frustration	Frustration	Frustration
Pride	Pride			Pride
Determination				Determination
Eureka	Eureka			Eureka
Disappointment		Disappointment		Disappointment

Table 3.1: Affective state of mind of students and possible transitions

Fig. 3.6: Learning mode and positive start

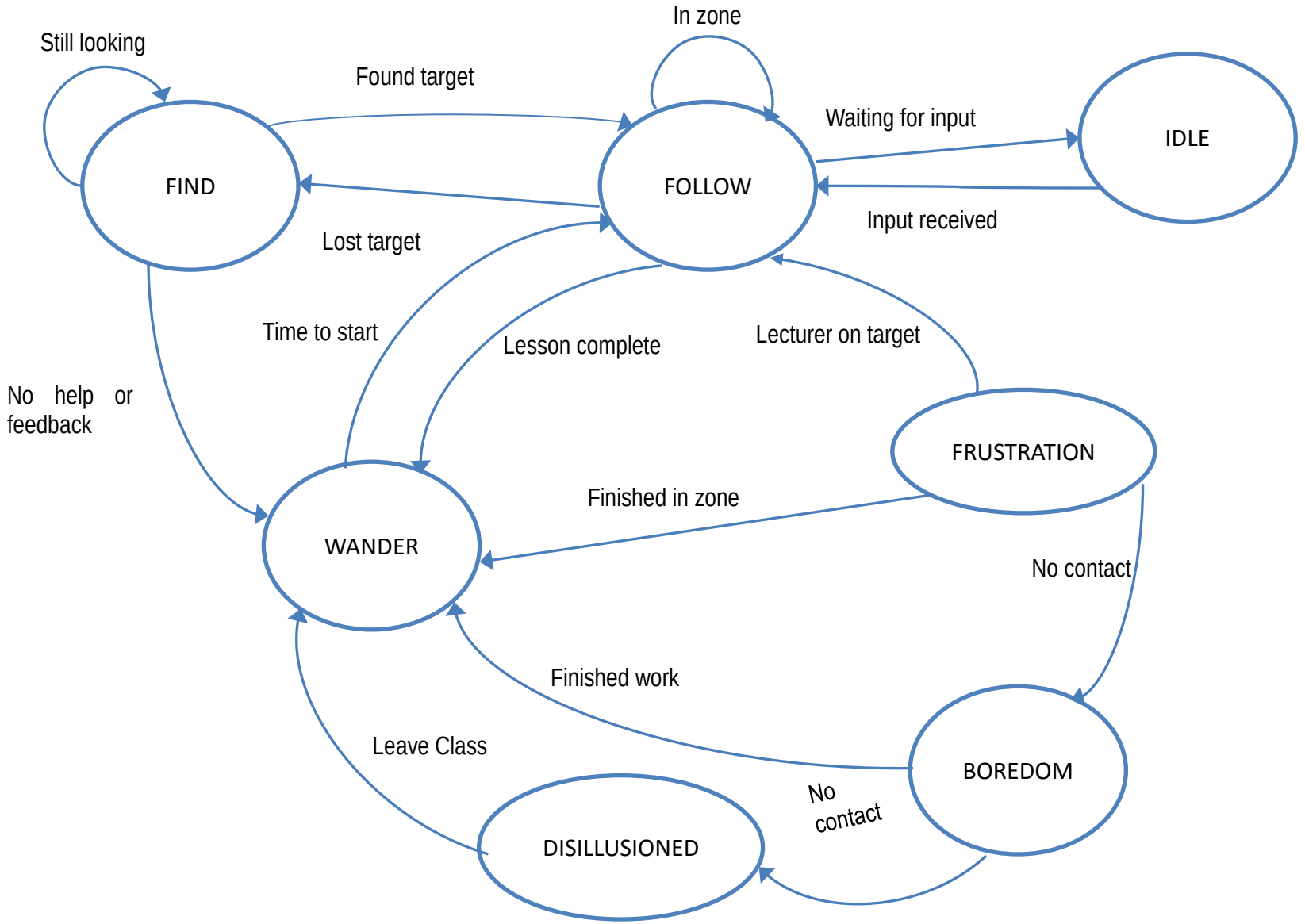
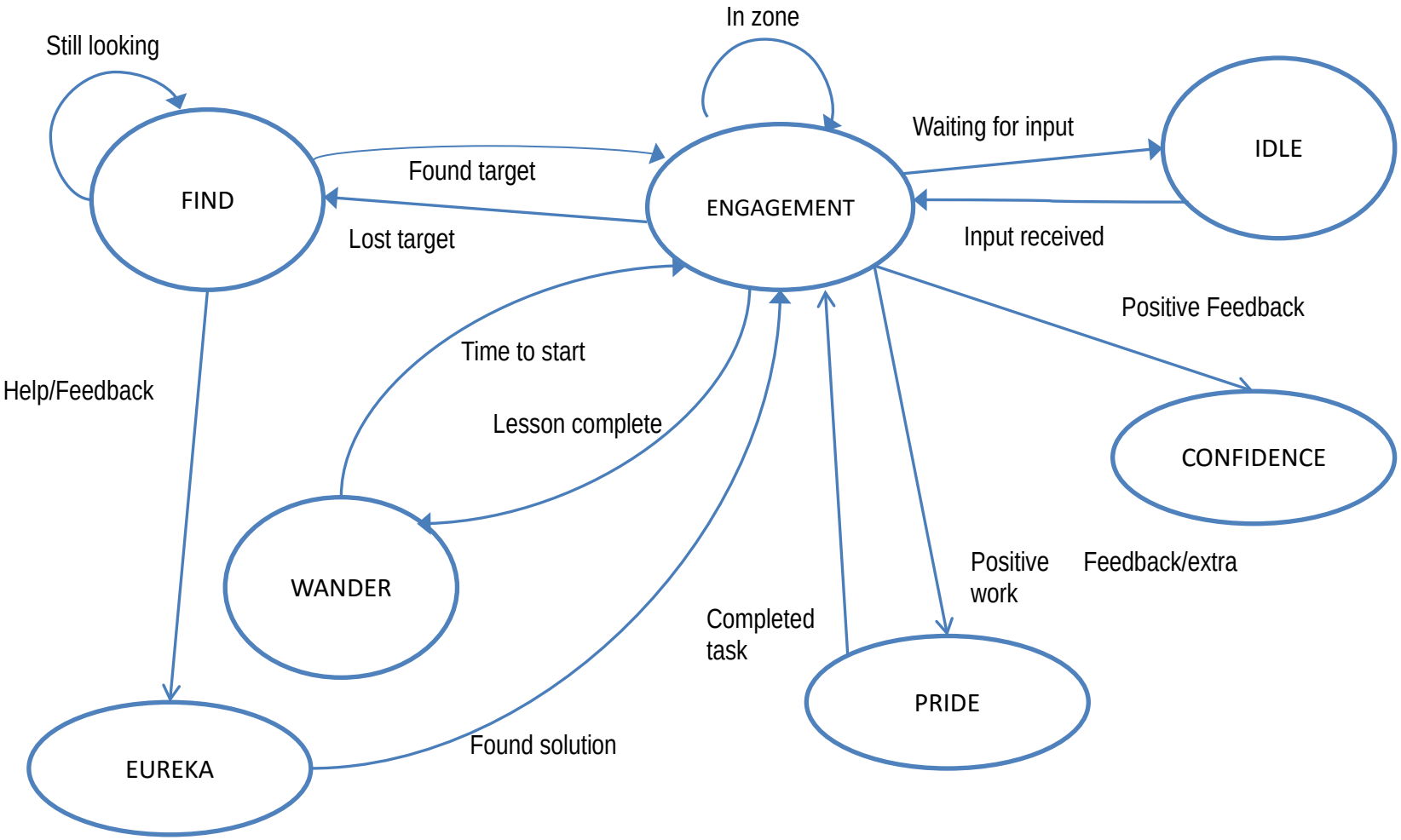


Fig. 3.7: Learning mode and positive all the way



3.7 Educational Pedagogy and Games

According to Becker (2005) one way to convince teachers to try out games is through pedagogy (which is why most of the research about game based learning focuses on the pedagogy); as she puts it by *"connecting elements of existing game designs with accepted learning and instructional theories"* (Becker, 2005).

3.7.1 Mapping Educational Pedagogy

Most game based learning researchers remain predominately in the domain of learning theories of Behaviourist, Cognitivism and Constructivism concentrating on the learning theories which are used as a basis for designing educational games, as introduced in section 2.5.3.
It is however worth looking at Becker's research (2007) and the mapping of learning styles to that of existing games and their design.
Becker (2005, 2007) claims that existing game design already coincides with Gagne's Condition for Learning and Gardner's Theory of Multiple Intelligence.

Howard Gardner's theory of Multiple Intelligence is concerned with social interaction and culture, whilst Robert Gagne's is concerned with cognitive constructs, through his five categories of learning outcome and his nine events of instruction.
Gagne's five category of learning outcome are:

1. Verbal information
2. Intellectual skills
3. Cognitive Strategies
4. Motor Skills
5. Attitudes

Gagne then relates the learning outcomes to the events of instruction in the form of the nine events of instruction.
Gagne's categories of learning outcome, was based on the characteristic of the content that the learner must learn; it differs from Bloom's taxonomy of cognitive outcomes (Knowledge, Comprehension, Application, Analysis, Synthesis and

Evaluation) which concentrate on complexity of levels. Becker states that Gagne's five learning outcomes is already present in most games (Becker, 2007).

Becker also feels that *"good"* games already meet all the criteria of Gagne's nine events instruction.

Gagne's nine events of instruction have the following

- Gaining Attention
- Informing Learners of the Objectives
- Stimulating Recall of Prior Learning
- Presenting the Stimulus
- Providing Learning Guidance
- Eliciting Performance
- Providing Feedback
- Assessing Performance
- Enhancing Retention and Transfer

According to Becker (2007), all the above exist in well-designed games. Though one has to be careful not to try and actually design a game as though it followed a lesson plan. Gaining Attention, Informing Learners of the Objectives and Stimulating Recall of Prior Learning is done at the beginning and sets up the scene. Becker (2007) refers to Gaining Attention as the *"attract mode"* where the game has video clips to entice the player and it also sets up the initial game; however one could consider the gaining attention to be the fact that a different medium such as a game would at least initially gain the students attention. Informing Learners of the objectives seems quite straightforward, however games can have several objectives and depending on the type of game, objectives are often ones that the player has to discover and may not be as distinct as in a lesson plan.

It is interesting that Becker (2007) states for the Assessing Performance *"feedback and assessment are typically coupled within games"*, equating Achievements with the assessment criteria.

Many educators want more than this, their perception of assessment is testing, rather than achievement being accepted as assessment for completing an

objective; whether the objective is solving a puzzle or obtaining an item required for a quest.
Our focus on performance goals rather than learning goals (Dweck, 2000) is to blame for most of the students' shift from learning to performance. According to Dweck (2000), a performance goal is one that aims to test the students' intellect, whereas a learning goal is about mastering new things.

Designing a Serious Game about what has been learnt and testing them, is really about performance goals rather than learning goals. One of the reasons that players enjoy the challenges in a game is that it tests their ability to learn new skills, to find the right strategies to achieve what they need to, but most importantly it does not judge their intellect or measure their ability. Though of course one could argue, that differing levels such as easy, hard etc. settings in a game might be considered as a form of measuring ability; however this is a choice by the player setting their own challenge level in order to facilitate the learning of new skills or the level of skill required to achieve a goal and not their intellect level. Their ability to deal with challenges would be undermined if they felt the challenges were then assessed as this would then be assessing their ability, judging their intellect rather than concentrating on the learning or the strategy to solve the problem they encounter. The other aspect of this is of course that students would just concentrate on the outcome of the measurement rather than the learning; concentrating on the grade rather than the learning. This is where the grade becomes the primary aim rather than the learning; a prevalent problem, where performance goals are more important than learning goals (Dweck, 2011). It also defeats the aim of trying to motivate and engage those that already feel either disconnected from the learning, feel they do not have the ability or simply feel disheartened at constantly being judged on their intellectual ability or lack of.

In a normal teaching environment Gagne's nine events of instruction is the basis of a lesson plan for most practitioners, and though one can see the similarities, one has to remember that a game does not proceed in strictly linear fashion nor is it as controlled or ordered as the above.

In her, “How Are Games Educational? Learning Theories Embodied in Games”, Becker (2005), also considers Gardner’s Theory of multiple intelligence stating that all of his eight primary forms of intelligence is addressed in a game. His eight forms are Linguistic, Logical-Mathematical, Musical, Kinaesthetic, Spatial, interpersonal, Intrapersonal and Naturalistic. Becker points that although not all games embody all the forms of intelligence most games do have most of them.
Jovanovic et al (2011), framed their Educational Game Metamodel (EGM) in order to define platform independent educational game concepts, by connecting player learning preferences and motivation states and classifying players according to Gardner’s Multiple Intelligence.
Parallel to this, is the popular learning style VAK (Visual, Auditory, Kinaesthetic) or VARK (Visual, Aural, Read/write, Kinaesthetic) favoured by many educators (Coe et al, 2014). Howard-Jones (2014) states that though presenting information in multiple sensory modes can support learning, reviews and studies have failed to support this approach to teaching.

However, most game based learning researchers remain predominately in the domain of learning theories of Behaviourist, Cognitivism and Constructivism concentrating more on the learning theories rather than the styles or mapping the styles to player styles.

3.7.2 Cognitive and Social aspects of Pedagogy

The link between Cognitive and Social is also one that is well known and was discussed in section 3.6. Vygotsky, in his “Mind in Society” (1978), eloquently shows the link between these two dimensions with his explanation of Zone of Proximal Development (ZPD); where he believed that children would not get as far if left on their own and that cultural and other forms of help are able to help with their development of problem solving tasks that they have not yet been able to master or that are just beyond them. Vygotsky defines the ZPD as *“It is the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration*

with more capable peers" (Vygotsky, 1978, p86). He states that once these processes are internalised they then become part of the learner's independent developmental achievement.

This guidance is often referred to as scaffolding; though often linked with ZPD and attributed to Vygotsky, the term was actually first coined by Bruner, Wood and Ross (Wood et al, 1976), and not by Vygotsky. This scaffolding is often interchanged with ZPD, though some interpret scaffolding as step by step support for everything and giving the learner the answer in the form of spoon feeding; the point of Vygotsky's ZPD was to give the learner enough support to solve a problem that was in their ZPD. The other important aspect is that the challenge had to be at the right level, too hard and the learner does not have the tools to solve the problem, too easy and the learner would get bored. Setting the right level of challenge is of course relevant to both aided and unaided forms of problem solving.

3.8 Summary and Discussion

Though this thesis is not concerned with testing learning, it is important to understand what aspects motivate and engage players to play games and keep them engaged. For after all it is this, that we hope to emulate and we therefore need to understand what aspects actually makes people want to play games before we can apply it to Serious Games. Until we understand how to build an integrated game that includes learning and gameplay, we cannot proceed to test learning; if we don't understand motivation in respect of gameplay and learning, we cannot achieve our aim.

It is important that we do not just port our educational motivational pedagogy into a game and hope that it will have the same effect, can we actually use it to test learning (as soon as it becomes a test style then it loses the value).

Motivation is the momentum to act and engagement is what keeps you in that action. You may get initial motivation with the novelty factor but the trick is to

keep in that engaged state; this does not mean that you have to be in flow state just curious enough to proceed to be involved with the action or task. So maybe, one has to consider what initial triggers can motivate and then what can sustain that movement.

However in defining motivational reasons for playing a game one must not lose sight of the fact that they need to bring an element of fun and that they must not lose the essence of what makes a game a game and not a chore. Though we may be able to inject Autonomy, Purpose and Mastery (or whichever synonymous terms you wish to use), if the educational tool does not give the essence of a game then it won't achieve the motivational factors that one aims to elicit.

According to Denis and Jouvelot *"Satisfying Deci and Ryan's innate needs increases the chances of experiencing an efficient learning. Yet, traditional education usually fails to provide a proper environment at the institutional level" (2005)*

The aim of using the motivational power of games, is surely for those that are amotivated; those that lack this intrinsic motivation. And it these, that we seek to motivate and engage by attempting to spark their interest.

It is important to distinguish that games that are used to train are not utilised to initially motivate but to make the concepts more interesting. These games are used as a more stimulating way of either presenting the information or in the case of a simulation, simulating a scenario in a safe environment or one that would be difficult to replicate in real life for the trainees to practice on.

Serious Games for training already have an advantage for those who need training, on boarding etc.; by the very nature that those that partake in this exercise already possess some form of intrinsic motivation be it, more pay, advancement, understanding a new concept more satisfaction, and it is related to a job. The motivation is already there to a certain extent; all these games do, is facilitate this in order to engage those that may find the concepts alien or difficult or have a different way of learning. In these cases, the extrinsic motivator is the reward they get for completing, learning or achieving the needed skill.

Whereas, students who are not initially engaged or motivated to learn have no intrinsic motivation and the extrinsic motivator initially is the game itself. So imagine trying to motivate and engage a student through a game and then removing all the elements that actually motivates and engage them in the first place, the true essence of the game, what would happen. They may initially engage due to novelty factor of classroom activity but it would be short lived.

Though we have to ensure we keep away from the pure edutainment style of games, we also have to ensure that we do not serve up what Bruckman (1999) refers to as *"chocolate-covered broccoli".*

The aim of using games because they motivate and engage depends on extrinsic motivation in order to ignite an intrinsic motivation. As educators, we are pretty good at ascertaining and finding ways of trying to motivate our students, unfortunately we are paralysed by our educational system which aspires to extrinsic motivation of achievements and grades as opposed to the intrinsic desire to gain knowledge. Our focus on performance goals rather than learning goals (Dweck, 2011) is to blame for most students shift from learning to performance. Designing a Serious Game about what has been learnt and testing them, is really about performance goals rather than learning goals.

"When the goal is to learn, one doesn't need to feel that one is already high in ability in order to remain engaged and persistent." (Dweck, 2011).

Just as Whitton warns against Prensky's stealth learning, one should also be cautious of using this medium as a Trojan horse; one that does not deliver the experience of a game.

"We are still alchemists of our trade, mixing two parts impure story with one part polluted game play with three parts market voodoo." (Cook, 2007)

4 GAME DESIGN PRINCIPLES

In order to understand how to develop Serious Games, not only is it important to take into consideration good educational pedagogy but one also needs to consider game design principles. Without understanding the main constituents of a game and adding educational content to a game environment, is as bad as understanding games and not incorporating sound educational pedagogy. There is a danger of producing, what Papert (1998) refers to as a 'Shavian Reversal offspring'; throwing out the good features and keeping the bad ones.

Special emphasis on Role Playing Games in relation to game design has been considered where possible, to support the design and development of the artefact. Reference is also made to the Oblivion engine from the Elder Scrolls IV: Oblivion game (Bethesda, 2006), used in the design and development of the prototypes. The rationale of genre and type of game engine used are considered in Chapter 6 and the design and development of the prototypes are covered in Chapter 8

Section 1 gives an overview, whilst Section 2 considers the main elements of games and introduces the main elements of Mechanics, Aesthetics and Narratives.
Section 3 considers the different frameworks and concepts that combine some of these elements, from the Mechanics, Dynamics and Aesthetics of Hunicke et al, through the Holodeck concepts of Murray through to Church's desire to find a common vocabulary for the term fun in his Formal Abstract Design Tools (FADT).

Section 4 explores the world of game Mechanics
Section 5 introduces the aspect of Aesthetics in context of game design and situates it in terms of emotion and experience.
Section 6 avoids the juxtaposition between Ludology and Narrative and the section concentrates on considering Narratives and its position in games.
Section 7 brings together some of the reasons players play and considers what players expect from a game.

4.1 Designing Games

Cook's "We are still alchemists of our trade, mixing two parts impure story with one part polluted game play with three parts market voodoo.", was his attempt to move game design from Alchemy to Chemistry in his 2007 article "The Chemistry of Game Design" (Cook, 2007). Although it may have moved on to Chemistry, Schell (2008) states game designers await their Mendeleev as they currently have no periodic table but rely on a "patchwork of principles and rules" to get the job done.
Though there is no definitive game design theory, there are guideline and principles that are well documented and used in the industry, and though some are reluctant to share their secrets, others like Schell, Crawford and Costikyan are only too happy to let us have a glimpse into their world. One of the difficulties of having game design theories set in stone is that the design process is by its very nature an interactive, iterative and creative process, making it often hard to quantify and pigeon hole into a set of defined steps. However, having said that there are enough documentation and guidelines that have emerged from game studies, game design courses and the game industry. It is most likely the reason that educationalist find it a difficult concept to handle, their instructional design has tried and tested ways of achieving the required design and are supported by theories of instructional design, the somewhat ad hoc creative nature of some aspects of game design is somewhat uncomfortable.

One must not forget the player's experience and though a game exists, it would not really be anything without a player's interaction (Juul, 2011); For instance Monopoly is a game in essence but only really becomes a game when the players interact with it, until then it is just a collection of items that facilitate gameplay. Game and players' experience is also mentioned by Schell as being one of the most important considerations (Schell, 2008).

One of the most important principles of understanding games according to Schell is "that the game enables the experience, but it is not the experience", this can be considered one of the concepts that is not only difficult to get our heads around but it also appears to be one that escapes us as traditional instructional designers. We are used to using learning and teaching pedagogy road maps to light our way to enable the experience of others with carefully paced, planned and controlled pathways; often a linear sequence of events that attempts to incorporate the best of our educational theories. That is the way we aim to educate; whilst that is to be applauded, that same controlled pathway can often lose the experience of what a game is about and with it, the power that we are trying to harness.

Though the player and the game may exist, it is only in the experience that the game becomes a game; the reason people play games is for the experience and experience is not a tangible thing like the game or player, it is imaginary (Schell). In linear media such as a movie there is some form of control by the designers/writers in order to obtain the type of experience from their users. However the very nature of games means that there is a distinct split between artefact and experiences and thus the designer takes less control in order to maximise the experiences for the player; the designer is interested in what the player feels in terms of choice, freedom, responsibility, and achievements among other types of feeling (Schell, 2008). This is achieved by giving more control to the player over the pacing and often the sequence of events, there is often very little linear interaction in a game.

4.2 Game Elements

According to Schell (2008) a game is composed of 4 main elements including game mechanics, aesthetics, story and technology. In terms of entertainment, most other types of media, such as books and movies can contain three of the elements but no other medium contains the game mechanics apart from games. According to him, none of the 4 elements are more important than any other. The mechanics is what “makes a game a game” and when you choose the mechanics, you then need to choose the appropriate technology that support these. The aesthetics enables you to emphasize them as well as the feeling of the game, and the story should enable the mechanics to make sense to your player (Schell, 2008). The following sections will look at the aspects of mechanics, aesthetics and narratives.

4.3 Frameworks and Concepts

This section introduces the main concepts of the above elements that can be found in designing games, these often incorporate, Mechanics, Aesthetics and Story and give a good overview of the main views

4.3.1 The MDA Framework

Hunicke et al (2004), define game mechanics as part of their MDA framework

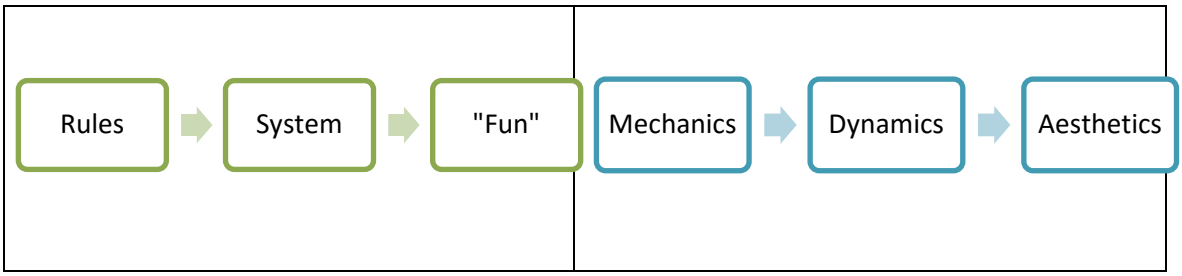


Fig. 4.1: Hunicke et al (MDA framework)

Hunicke et al state that the Designer has a view from the perspective of the Mechanics to the Aesthetics, whereas the Player views it from the Aesthetic viewpoint towards the Mechanics. Their interpretation of the Aesthetics includes the emotional response rather than just the feel and look of the game.

Hunicke et al include 8 main categories of aesthetic experience that they term as 8 kinds of fun, though they point out that it is not limited to the taxonomy they list (Hunicke et al, 2004).

1. Sensation *(Game as sense-pleasure)*
2. Fantasy *(Game as make-believe)*
3. Narrative *(Game as drama)*
4. Challenge *(Game as obstacle course)*
5. Fellowship *(Game as social framework)*
6. Discovery *(Game as uncharted territory)*
7. Expression *(Game as self-discovery)*
8. Submission *(Game as pastime)*

According to Hunicke et al, taking the above aesthetic taxonomy as a starting point, models of gameplay can be defined in relation to the dynamics and aesthetics of gameplay models. They state that “Dynamics emerge from the Mechanics” and that “Dynamics evoke Aesthetics”

- Mechanics: The rules and concepts that formally specify the game-as-system.
- Dynamics: The run-time behavior of the game-as-system.
- Aesthetics: The *desirable emotional responses* evoked by the game dynamics.

(Hunicke et al, 2004).

Hunicke et al, describe games as state machines. They also suggest looking at games as dynamic systems and by moving between the three parts of MDA, it is easier to have a concept of the dynamic behaviour of the system. Moreover, if one considers them as systems, they need to be designed and developed in an iterative manner (Schell, 2008). The MDA model itself can be used as a means to move between the three levels of abstraction in order to help control the desired outcomes and behaviours (Hunicke, 2004).

As can be seen from figure 4.1, the mechanics can be either rules or actions that players perform, the dynamics are how the actions behave or change state due to player input and the aesthetics are the experiences of the player.

If one thinks about this interpretation of Aesthetics, it does make sense, one often talks about gameplay or what did it feel like, did you enjoy it and was it fun? The sensations that are experienced in playing include the whole game. Oftentimes Aesthetics describes just the look and is often thought of in terms of graphics rather than the whole look, feel, fun or gameplay. (What is that makes it fun, enjoyable, and creates the player experience?). Therefore, another way to look at it may be from the viewpoint of Action, Behaviour to Experience as shown in Figure 4.2

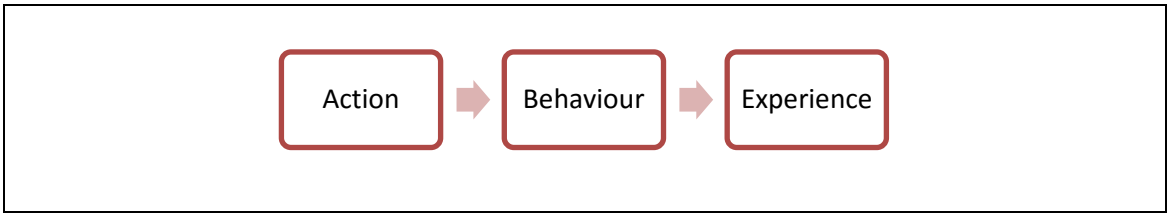


Fig. 4.2: Another way to look at the MDA

4.3.2 Hamlet on the Holodeck (Another perspective)

In her book 'Hamlet on the Holodeck: The Future of Narrative in Cyberspace', Murray (1998) identifies four main properties that digital environments have; Procedural, Participatory, Spatial and Encyclopedic. She further adds that Procedural and Participatory are related to the interactivity. Procedural, being in the domain of rules and ruled based descriptions of the world, in order to facilitate meaningful and believable behaviour. She further mentions Eliza and considers Weizenbaum as the first true literary artist in the computer medium as he successfully applied procedural thinking to behave as a Rogerian Psychotherapist with Eliza.

Murray proposes that if the procedural property is responsive to our input we participate and it is this, which makes interactivity. These two together "create an environment that is both procedural and participatory" (Murray, 1997 P74)

Murray further advocates that the two remaining properties; Spatial and Encyclopedic enable digital creations to be explored and extensive and relates this to immersiveness.
One could consider Murray's Procedural and Participatory properties as corresponding to the Mechanic and Dynamic properties of Hunicke et al.

4.3.3 Formal Abstract Design Tools (FADT)

Church's FADTs (1999), came from his desire to define a common design vocabulary for what designers call "fun" and "not fun" in a game. Church (1999), goes on to suggest that formal definitions were required to explain concepts to other people thus avoiding ambiguity and that the abstract was required to ensure that designers did not relate terms to just one genre or game construct.

In spite of wanting to avoid ambiguity by using formal and abstract terms, Church's terms seemed ambiguous in their definition. This is true of his term 'Intention' and it is not quite clear as to whether he means agency or formulating a strategy. His FADT of intention has the explanation of *"Making an implementable plan of one's own creation in response to the current situation in the game world and one's understanding of the game play options."* (Church, 1999) Church does offer further insight into this, he explains by understanding the world, the logic of the game with the addition of the ability to accrue the goals of the game gives us the ability to plan our course of action and to act accordingly. This is what he refers to as Intention, allowing and encouraging the player to act intentionally. His next two FADT of 'Perceived Consequences' and 'Story' are clearer in their definitions. His Perceivable Consequence FADT is easier to get to grips with*; "A clear reaction from the game world to the action of the player".* (Church, 1999) This is the feedback of the action taken and the pleasure we perceive, when our actions are acknowledged and/or make sense; however as Church points out some actions do not always make sense to the player. He also suggests that RPG tools work better when Consequence is attached to Intention; this gives the player more sense of autonomy.

His last FADT 'Story' is defined as **"***The narrative thread, whether designer-driven or player-driven, that binds events together and drives the player forward toward completion of the game."*

According to Church some adventure games that have little intention or perceived consequences but gain in story and he goes on to augment this by stating that most games possess an element of story even if it is that of the player. According to Fencott et al (2012) Church's FADT are really aesthetic representations, they disagree with Story being an aesthetic pleasure as they feel there are many games that are immersive without the need for a story and possess a sense of agency; citing Tetris as an example.

4.4 Mechanics

The term game mechanics is a concept that seems simple enough but various theorists have different interpretations as to its precise meaning.

Cook's (2007), definition of Mechanics is *"Game mechanics are rule based systems/simulations that facilitate and encourage a user to explore and learn the properties of their possibility space through the use of feedback mechanisms"*.

Whereas Hunicke et al (2004) in their MDA framework consider Mechanics as *"Mechanics are the various actions, behaviors, and control mechanisms afforded to the player within a game context."* Sicart (2008) however feels that neither of these would be sufficiently useful for the analysis of games. He remarked that though Cook's definition was valuable in that it situated feedback as an integral component of games and in aiding the understanding of mechanics, it failed to explain how we can identify mechanics or how it fits in within the rule system. As for the Hunicke et al definition, Sicart remarked that though *"The MDA framework provides insights into the relations between the formal, algorithmic elements of games and how they are presented to and manipulated by players."* He felt that it lacked precision and was inconsistent in its formulation, especially in the fact that *"behaviours afforded to the player"* could be considered as a strategy rather than a pure mechanic. Some

behaviours do not manifest in an action that can be taken (it may suggest to you it is possible to push something but the mechanic does not allow you to achieve that action). Sicart also states that some actions that happen within the system without the player's intervention (Sicart gives an example here, "as the effect of gravitational fields in *Orbital* - external to player agency, yet related with the player's actions").

Sicart's definition is *"game mechanics as methods invoked by agents for interacting with the game world."* He follows Jarvinen's (as cited in Sicart, 2008) method of describing mechanics as verbs jump, shoot etc.; this is a common and familiar definition of the basic interpretation of what a mechanic is and one which not only resonates with the author but one that is easier to assimilate. His inclusion of using *"agents"*, does clarify the terminology, as actions are not just performed by players but the system, including NPCs that may have special actions but could affect the player.

However as Sicart shows, the addition of rules can muddy the waters.

Mechanics and rules according to Sicart are defined by mechanics to do things and are methods of "agency" whereas rules check to see if it is possible or how to do those things and are therefore considered as properties. IE method climb, if property stamina is too low then cannot climb (translation of rule).

Using Sicart's definition, let us delve into an example away from games; consider mechanics as a steam engine and the mechanics that make the machine move. A steam engine is basically a big kettle on wheels with somebody's thumb on the spout to generate pressure. The fire generates the steam, which then goes through the cylinders on the side of the engine, powers it and then it moves.

Consider the moves part as the mechanics, but it would not move without all the other elements. It has constraints and is regulated by certain rules; if no fire or water then no steam etc.

So if considering an interpretation of Sicart's definition of game mechanics, one could consider 'Move' as the mechanic, which would be determined by the property called steam/pressure. If there is no steam, the pressure is lost and the engine does not move. Obviously as it moves it will use up the steam until it runs out of steam in which case it cannot move any more.

As Sicart (2008) states it is sometimes difficult to distinguish between the two but rules tend to be properties that check how it is done or if it possible to do whilst mechanics are the actions. He puts forward the argument that rules and mechanics are *"ontologically different"*, in other words, mechanics do things and rules check if it is possible to do and how it is done. Of course, one could argue that there are rules within the game that require no action but in that instance, surely the constraint imposed on that rule would be the property that Sicart refers to.

4.4.1 Mechanics, Dynamics and Rules

Mechanics are the rules of the game, which incorporates what actions the player can take. One could consider the mechanics as the combination of rules and actions; rules that the game designer sets and the actions that the player is afforded within the boundaries of the rules.

Thus, the rules define the different procedures, regulations and constraints that the designers have decided on; what is allowed, how much ammo you can carry, what you need to do in order to win, the conditions you need to fulfil in order to accomplish something, what conditions trigger what state etc. The actions are the affordances allowed in the game; jump, shoot, climb. These affordances can be governed or limited by the rules of the game; you can't run if you have no health, you can't talk if you are in the middle of battle. Sometimes they are governed by the engine, for instance an engine might not enable you to use a climb action; the Oblivion engine (used in the making of the prototypes, see Chapter 6, Section 4), does not have the capacity to carry that out, so a player climbing is shown as an animation or cut-scene. The mechanics therefore are the rules of the game and actions of the game within those rules; the rules are set by the designer as are the actions but the designer is constrained by the engine.

The term Dynamic is often thrown into the mix of the discussion of mechanics which can add to the confusion, but one can consider the dynamics to be the behaviour of the game that acts upon the mechanics.

The dynamics can be considered the behaviour of those actions, but more than that, the strategy one can use to manipulate the basic actions within the rules in

order to derive a particular behaviour in a given situation. For example; if kill 500 enemies is a Mechanic (action with rule), sitting next to a save point to shoot and save as you go along is Dynamic that comes from the Mechanic (taking advantage to achieve your goal, have a strategy to do it).

Sometimes this can bring about emergent behaviour that the designer did not anticipate, it could allow the player to exploit the mechanics to their advantage. In a recent article as a featured post in Gamasutra (Sept 2015), the problems of hacking, cheating and exploiting were expressed about the games, Destiny (FPS with online MMO, 2014, Bungie) and ArchAge (MMORPG, 2013, Trion). Both developers reacted differently to the exploits, ArchAge banned anyone who looked remotely suspicious, whilst Destiny's developers ignored it; neither of which were suitable solutions according to Ahlborn's article in Gamasutra (Sept 2015). This of course is something that needs to be addressed for educational games, as you would not want the players to either hack, cheat or exploit it. Exploiting a game to gain advantage in some cases is not a bad thing; it shows creativity of thinking up different strategies and can enhance gameplay or bring some interesting emergent qualities. However cheating or hacking the game is one aspect that needs serious consideration and the developer needs to ensure that it should not be possible to do, especially in the design of an Educational Serious Games.

4.5 Aesthetics

Aesthetics relate not just to the graphics but also to the feel. When discussing Aesthetics, we are therefore not just thinking of the way it looks but also the way it feels. Does it feel right? Does it look right? An important point here is that not all the possible Aesthetic elements are found in every game, just as not all the mechanics possible exist in all games. The aim of the designer is to ensure that the right elements are afforded for the right style of game to ensure good gameplay for the player.

Looking at it from the viewpoint of Software Engineering and Systems Analysis, Aesthetics is what would come under the remit of non-functional requirements; the term that causes so much confusion in my student's understanding. This includes the feel and look of the system and though the term unfortunately denotes it is unimportant; without this you may have a system that functions but not what the user wanted, especially if it is unusable to the user. Without consideration of the aesthetics, you could have a game but not a very good one.

There are still those theorists in educational Serious Games that seem to ignore or misunderstand the essence of this aspect. The solution of just wrapping learning content with a story or a challenge without considering the impact on gameplay is still prevalent and made more so by Gamification; a quick and easy fix to gamify learning. There is nothing wrong with this, if one wants a learning tool, but throwing in challenges, story lines and other elements ad hoc, without understanding what makes a game, will at best make it a gamified learning tool but not a game that players equate to as a video game. It is video games, after all, that researchers have stated, motivate and engage.

It is this experience, the emotions that the game elicits that are overall why people play games (Schell, 2008). Costikyan (2002) maintains, that you need to set out consciously to decide on what sort of experiences you want your players to experience, and that you cannot simply add random game elements together without understanding why and how game structures shape players behaviour. He further reasons that games may shape the behaviour but it does not determine it (Costikyan, 2002), this of course, could be considered as another aspect that is contrary to educational pedagogy.

The problem with Serious Games is that they are boring, (Kirriemuir & McFarlane 2004; Klopfer et al, 2009; Appelman, 2007) they often ignore the need to consider the experience of the player. The aim of a Serious Games is to impart learning of some sort and they forget about the experience. A lot of the researchers (Whitton 2012), amongst them, talk about the fact that the challenge will make them engaged, but it won't unless it appeals to the player and is situated within the game structure to integrate content with gameplay.

The outcome has to be interesting, instructional designers often worry that the game won't fit in with pedagogical design; however aspects of constructivism,

behaviourism, associative, situative/social and cognitivist approaches can easily be included in the design. What often lets it down is the porting of instructional design to a medium that is not always suitable for the interpretation of instructional design. Section 7 considers how learning strategies could be mapped to a game, specifically RPG ones. The danger is in how it is mapped without endangering the aspect of gameplay or the educational pedagogy; thus avoiding Papert's 'Shavian Reversal Offspring' (Papert, 1998).

4.5.1 Aesthetics: From Holodeck to Engineering Emotions

In their attempt to move away from words like fun or gameplay, Hunicke et al define Aesthetics within their MDA framework as, "The *desirable emotional responses* evoked by the game dynamics.", and give a list of 8 main categories of aesthetics which they term as Sensation, Fantasy, Narrative, Challenge, Fellowship, Discovery, Expression and Submission as previously mentioned in section (4.3.1). They stress that this is not limited to their taxonomy of 8 and that though there is no definitive way to know what combination or proportion of elements to enable the formulation of what one considers fun, or 'Grand Unified Theory' of games; this would be a start to help describe and ascertain the appeal of different types of games.

Components of Aesthetics

In an attempt to establish a general aesthetic understanding of games, Fencott et al (2012) consider Murray's (1997), three basic components of aesthetics of Immersion, Agency and Transformation. They describe Murray's three areas as:

- Immersion: Be able to get lost in the story/game
- Agency: To feel some degree of control over what is happening
- Transformation: To be enhanced with extra powers, to become someone else or something else

(as cited by Fencott et al, p56).

They make a distinction between Immersion and Presence; Immersion being attributed to technology and Presence to the state of being lost in game and come to the conclusion that Presence would be used instead of Immersion.
Fencott et al (2012), way of looking at Aesthetics differs to that of Hunicke et al, though they also ask what can one get from the game. Its emphasis is different from Hunicke et al from that of a game pursuing one or more aesthetic goals; they ask "*what aesthetic pleasures are on offer*" (p49) and use this as a way of categorising a game, but stress that this is not the only way to look at them.
To finalise their interpretation of aesthetics, Fencott et al, also included Turkle's view, (as cited by Fencott et al (2012)), that co-presence was a major factor in contributing to the aesthetic pleasure.

They finally came up with their view of Aesthetics as including, Murray, Church and Turkle's understanding. However Fencott et al (2012) did feel that as not all games include stories, they used the term Narrative Potential

- Agency
- Intention
- Perceivable consequence
- Narrative Potential
- Transformation
- Co - presence
- Presence

They propose that Agency is shown by the relationship between Intention, Perceivable Consequence, Narrative Potential, Transformation, Co-Presence and Presence (Fencott et al, 2012).

Aesthetics as Emotion

It is clear from the above that Aesthetics can be looked on from the viewpoint of emotion or experience.
According to Sylvester (2013), one of the most important indication of good gameplay is how a game makes us feel. He rationalises this from the view that when a gamer is asked what they think of a game, they usually tell you what they think, but in reality they are actually tell you how they feel.

Though they may pose arguments about the good and bad aspects of the game, this rationalisation of what makes a game good or bad is in fact an underlying rationalisation of their emotions; they are in fact stating how they feel (Sylvester, 2013).

Though Fun is the emotion that is often associated with games and considered one of the design goals, Sylvester, advocates that it cannot describe the range of emotions or their influence on games (Sylvester, 2013). This view is shared by many including Adams (2008), who considers Fun to be a too limited a concept and even considers enjoyment too restrictive.

Designers may look on the aesthetics, goal, gameplay or feel of the game differently but all of them aim to achieve the same thing. Some refer to it as the feel and the goal in terms of Aesthetics, others Pleasure and others yet eliciting Emotion or Experience; it is that elusive thing that gamers call fun if they enjoyed the game, or not fun if they didn't get the experience they were expecting.

Sylvester suggests that emotional triggers are triggered by the game mechanics that generate events that in turn provoke the emotions. Though if one follows the MDA framework, it would probably be more correct to state that the mechanics enables the dynamics that then trigger the emotions. In order to obtain an emotion there has to be a meaningful change to what Sylvester defines as Human Value and these have states of neutral, positive and negative. These Values have to be important enough to change the shift between these states, often these are polar opposites such as life/death or danger/safety. Sylvester considers these as powerful events as they represent *"huge shifts from ignorance to knowledge, from low status to high status, and from defeat to victory"*, (Sylvester, 2013) an aspect that should be capitalised on for Serious Educational Game.

He further states that, emotions do not just appear in response to a shift in state but also in anticipation of change; anticipation of threats or opportunities. Changing shifts constantly to generate change can be hard, Sylvester suggests that a reveal of information can act as an equivalent to change and keeps things

more interesting in a game and rationing some of the information in a structured way can help create a sense of suspense.

Sylvester (2013) puts forward the argument that we create the experience through the emotions and refers to some common emotional triggers, which are listed below. However, Emotion through Learning will be given special consideration as it pertains to learning. According to Sylvester games that teach you a concept, to fight, to socialise or to build have higher impact and the harder it was to get the concept the higher the value. Too easy and the value is diminished and there is no buzz. It is even better when the player feels 'INSIGHT' when they obtain a new piece of information that helps make sense of the preceding information. This is where the design in SG, could give extra clues to those who fail to interpret the original clues, if they get it, even afterwards; this gives them a sense of hope that they may be able to understand or interpret the clues correctly, the next time. For some it is sufficient that they have finally understood the concept, even if they did not manage to solve it.

The rest of what Sylvester describes as emotional triggers are listed

- Character Arcs (empathy with characters or story)
- Challenge (as long as skill is mapped to challenge, not too hard, not too easy; gives you a feeling of success, frustration, need to try again..)
- Social Interaction (Competition, Showing Off, Sharing, Helping…)
- Emotion through Acquisition (Loot, Items, Collecting)
- Music and Sounds (Different types of music. Oblivion for instance has some superb music. Ambient sounds like rain can evoke emotion but some can be irritating)
- Spectacle (Blowing up things or special effects but can be shallow if overused)
- Sexual Signals (Bare skin or pretty/handsome face, but can be tasteless or overused)
- Emotion through Beauty (should be channelled towards a purpose, otherwise it is a bit like spectacle and diminishes in impact)
- Environment (Environment, weather, seasons)

- Emotion through “New-fangled technology”
- Primal Threats (Spiders etc. however these have now been overused and need to craft threats that affect at a deeper level)

(Sylvester, 2013)

Though aspects like Environment, Music, Sound and Beauty were mentioned above from the aspect of how a game feels through the exploration of emotions, these will also be considered in the following section from the aspect of how a game sounds and looks; which ties in with the accepted definition of Aesthetics.

4.5.2 Aesthetics: Visual and Auditory

Though the term Aesthetics, has been looked at in terms of experience of a game, the term is most often associated with the look, feel or artistry of an artefact.

Graphics in a 3D environment is important, though it may be considered by some as eye candy, but it adds the impression to the player of a well-designed game. The new Elder Scrolls V: Skyrim (Bethesda, 2011), the successor to the Elder Scrolls IV: Oblivion (Bethesda, 2006), has improved graphics set in an expansive world made possible by the improvement of software and hardware capabilities since the original Oblivion game of 2006. Juul’s (2011) maintains that some games do not lose their appeal due to less than perfect environment or less than perfect equipment in terms of aesthetics which he refers to as ‘rules of irrelevance’ and Whitton (2012) also agrees with the view that players would be forgiving of less than perfect environments. It is certainly true of some games; players still play Oblivion and other games that are considered dated and old. But for some the glitter of new graphics is important and as Calleja (2007) points out, it would be imprudent to discount the influence that graphics and indeed sound have. I was often asked why I did not use the new engine for this study as the graphics were much improved; my initial design and development phases started before the new game was published. Nevertheless, I was also met with *“oh, it is my favourite game”*. There aren’t many players that have never heard of Oblivion.

Though most players agree that gameplay is the most important aspect in a game, graphics do matter. In a report by Consumer Electronics Association (CEA) (cited by Usher, 2014), stated that 75% of gamers feel that graphics do play a part in their decision to purchase a new title. However most players agree that gameplay is the most important aspect but graphics do matter, more for some than others.

Closely linked to graphics is the environment, which encompasses the game world. This can include such aspects as the geographical features, fauna and flora, climate, and artificial constructs such as items, buildings, villages etc.

The environment on its own is not sufficient; this is enhanced by the interactivity of the various characters that inhabit this space. It can be further enriched by the sounds that are emitted from the environment or the characters; these can be anything from the wind blowing, to cows mooing or conversations heard from various NPCs in a village. Another type of sound often heard is music, again enhancing the experience of the player.

Alongside Sylvester's emotional triggers mentioned in section 4.5.1, one can align Hunicke et al (2004) aesthetic experiences of Sensation, Fantasy and Discovery. Sensation, which they term as 'game as sense-pleasure', would map to the graphics, music and the beauty of the environment. Fantasy which they term as 'game as make-belief', would map to being in a world as Costikyan (2002) suggests as the fictional constructed world; this includes not just the environment but the whole concept of the game and the interaction found within it. Discovery which they term as 'game as uncharted-territory', would map to the various locations that players could discover but could also refer to the various characters, objects and challenges they could encounter.

Though not all these aspects are found in all games, these are important considerations for designing a Role Playing Game (RPG) which is what will be designed and developed in this study.

4.6 Narratives

Narratives are often considered as part of Aesthetics, but it deserves its own section. There is an ongoing debate between Ludology also referred to as rules, game or simply mechanics and Narrative also referred to as Fiction; but I leave it to those who wish to delve into the juxtaposition of the two and will only briefly situate the two. I take the view of Cook (2014), who feels the discussion is outdated and that there is no 'versus' in considering the two.

4.6.1 Narratives in games

Games, as Juul (2011) reasoned, can be rules and fiction but some games have no stories and others have more. Juul (1998) also states that games are not narratives, though games can have narratives or elements of narratives; it is not what makes them a game and he also felt that the term narrative did not fit games; as the term can have many conations, from storytelling to the way we make sense of the world (Juul, p156).

According to Calleja, (2007), narratives come in two broad categories, those that the designer has scripted and intended and those that are interpreted by the player through his/her interaction.
Zimmerman (2010) argues that every game can be considered a narrative system, however Koster (2012) states that games can and do exist without narrative and considers narratives as a form of feedback. Fencott et al (2012) give a great example in the form of Tetris; it is a game that is challenging, but has no story to speak of.

One could consider that narratives can be a form of feedback; if it is a movie, a cut-scene or some form of feedback that moves the story along. Therefore, some elements of feedback could be considered both, as belonging to the Aesthetic in the form of Narrative, but also belonging in the domain of the Dynamic response.
Feedback can take many forms, it can show the player's progress, be a response to player action, it could also be the system response in forwarding

the storyline by using a cut-scene, but surely Narratives need to be considered as more than that? Sometimes the background story is already known, especially in a series of games and a style of story or continuation is expected. Narratives can come in the form of background narratives, sometimes we know what the story is, other times the story can unfold through a series of reveals or feedback.

Murray (1998) in her “Hamlet on the Holodeck: The Future of narrative in Cyberspace” proposes three aesthetic categories for the analysis of interactive story experiences: immersion, agency, and transformation.
She suggests that Immersion can be thought of as Suspension of disbelief; Agency as Interaction with choice and Transformation as Identification. Following on from Juul’s discussion of where he states that narratives are not games, a game based solely on story, would not really be a game but an interactive novel.

Murray (1998) states, *“Agency is the satisfactory power to take meaningful action and see the results of our decisions and choices”* (p126).
“We encounter a world that is dynamically altered by our participation” (P128)
In regards to Immersion *“Participation in an immersive environment has to be carefully structured and constrained”* (Murray p106).

The use of narratives in games can be anything, from a simple-cut scene to large production style movies such as those found in some Japanese RPG. It can also manifest itself throughout the game, evolving or revealing itself in small nuggets of information. This reveal can be as simple as reading a book or journal that you find, helping the story along, cut-scenes, rumours and discussions with NPCs can also tell stories.

Storylines give meaning to the game, but obviously not all games have stories. However, all games need a purpose, the aim and objective of the game, whether this is to build a civilisation, to collect, to get from A to B without getting killed.

RPGs and adventure games usually have a storyline; this aids in the advancement of the game and also enables us to feel more involved with the world. FPS such as Call of Duty have a story line, each mission is in a way a story, which gives purpose and context to our mission.

An RPG usually has one main storyline going through it, but could also incorporate numerous mini-stories in some of the quests that have no relevance to the main story but adds to the feeling of immersion. For instance, rescuing a daughter of an NPC that has been kidnapped, fighting off the enemy and then returning that NPC is satisfying to a gamer. If the designers allow the NPC to be killed, then it is possible the player will redo that quest to see if they can save the NPC. We need a reason to do quests, we are curious creatures and by and large, we want to know the purpose of the quest and the reason we are doing it. Though we accept certain quests that do not really have a story but a purpose; we feel more involved if we know what is going on, we feel empathy with the world; an RPG thus invokes a sense of immersion/involvement in the world and its narrative.

This emotional meaning found in narratives, goes even further in our fictional world, into the way we interact with the fictional characters. Sylvester (2013), states that we tend to attribute human form or personality to things not human. This need to anthropomorphise that Sylvester refers to has however been with us from Ancient Times in forms of fables and myths.

<table>
<tr>
<td>  </td>
<td>Pixar's animated Lamp Logo is a good example of this. It shows a playful desk lamp, named Luxo Jr. appearing at the beginning of most Pixar movies. He hops to the word PIXAR and stops to the I and then jumps on it, until he squashes it.</td>
<td> 
</td>
</tr>
<tr>
<td colspan="3">Luxo has swept the imagination of people so that there are many video's and articles about him, including one of him being condemmend for killing the letter I</td>
</tr>
</table>

Fig. 4.3: Pixar's lamp Logo

In modern times, this is shown clearly in the Pixar movies such as Cars, Planes and Toy Story where we respond to the inanimate objects as if they were real; this applies to adults as well as children.

This does not just extend to movies but also to books. Children's books are full of anthropomorphised characters such as in Alice in Wonderland's rabbit, Wind in the Willows' Toad of Toad Hall and who can forget Winnie the Pooh or Eeyore, the sad, depressed and apathetic donkey, but somehow we resonate with him. What about Tiger the one that bounces all over the place and makes us feel happy; we resonate with him too. This of course also extends to the domain of books read by adults, in fantasy tales such as the Lord of the Rings.
However it is worth noting here that just adding a narrative does not make it a game, it has to have a purpose, a reason to be there and fit in within the world. As Sylvester points out, that it is often falsely believed that this layer of fiction is where all the meaning comes from, but in reality it only adds another layer of meaning.

4.6.2 Situating Narratives within MDA

Simply including a story or situating an educational content in a virtual environment without concern for the interaction of the components of Mechanics, Dynamics and Aesthetics will not miraculously imbue the game to draw out the motivation and engagement we seek; we need to understand the balance between the Mechanics that determine the Dynamics that in turn evoke the Aesthetics. The Aesthetics is all about the feeling of the game and the emotions it elicits and is ultimately what the player experiences but Narrative (adding fiction) is as previously stated only another layer that the player experiences.

The addition of a virtual environment does not make it a game, as previously mentioned in Chapter 2, but neither should it be considered as an element that enables the feeling of immersion. The term immersion itself is open to interpretation, the feeling of being transported into an alternate reality and that

this environment together with the fiction will somehow make the player forget he is playing a game. As Sylvester reminds us that *“no player forgets that they are playing a game”* (Sylvester, 2013, p30).

It is a basic assumption that if a player is engaged and engrossed he is immersed in the game, but Salen and Zimmerman also make us aware of what they term as ‘immersive fallacy’, that the engagement occurs through play itself and it is an experience that is felt by the player (Salen and Zimmerman, 2004, p38).
The engagement and emotions are derived from play and that depends, on the whole design and the interplay between the elements.

4.7 Technology

Having considered some of the elements during design it is important to ensure that the chosen technology is capable of supporting the design of the game in terms of Mechanics, Dynamics, Aesthetics and Narratives. For example if you want your game to include a lot of physics simulations within the game that players interact with, choosing a game engine developed primarily for RPG would not be suitable. If you want triple A+ game style graphics as seen in Call of Duty or even America’s Army, you would not consider using an engine that is only capable of platform style games. If your game idea is to include a world that can be explored for History and your game is the story of the life of a roman soldier but you end up doing a platform game; it will not resonate with the player as much as an RPG, FPS or an adventure game. Conversely if you want the player to climb ladders as a mechanic, you need to ensure that your engine gives you that capability.

4.8 Why do players play and what do they expect?

For after all that is why game designers design games, why players play and why as educators, we need to understand or attempt to find an answer to these questions.

It is perhaps safe to say that players will say they play games because they want to have fun, but it is equally safe to say that we have gone past quantifying games merely with the concept of that word fun. In this journey that we have taken together with the likes of Schell, Sylvester, and all the others that were mentioned, we have progressed and come to the realisation that there may be no definitive answer to that question and that players play for a number of reasons and their motivation to play could alter. But for the sake of argument let us say we have found the holy grail of why players play, that we are in a position to at least come up with a list.

Players play to be

- To be challenged
- To Socialize
- To Explore
- To Feel in Control
- Curiosity

Obviously, that is not a definitive list, it incorporates some of what Lepper and Malone, Deci and Ryan have already stated. But most of all, whether they play for pure escapism, to be challenged by competition with themselves or others, to feel a sense of belonging or to bring some order in their lives, they ultimately play because they want to; it is a voluntary activity that they deem “fun”. We decided that fun was not really a quantifiable, so suffice to state they deem it fun because it enables them to experience some of the above. We also came to the realisation that this experience has to be worthy of their time; if they are investing time to be challenged, they expect to be challenged, if they are playing to feel in control, they expect to have some sense of control. We also looked at the fact that the experiences are related to the emotions of the player, and that sameness in challenge, control or anything in the game would dull these emotions; they need a range and valence of emotions.

So though we have somewhat come to an agreement of what motivates players, what is it that they actually expect from a game in order to satisfy some of their needs/expectations? Players expect some of the following:

4.8.1 Fairness

Fairness in game or the perception of the player that the game is fair is paramount to a good game. In fairness I do not just mean that the challenges are fair to the player, though of course these have to be equated to the player's skill in order to achieve that state of flow. But fairness covers many things in the eyes of a player, they have to feel that the game is fair in the rewards and punishment that is given. For instance if they have accomplished a complicated or difficult task they expect higher reward; especially if a previous less difficult task was rewarded at a higher level. The game or task has to be achievable and the rewards and punishment have to seem fair. Birdwell (1999) declares that if players blamed the game for failure, they would consider it an unfair game, but if cues are given to the player and they still fail, then they would consider it as a failure on their part. There of course times when the designers decide that a certain NPC will die regardless of how many times or ways you try and save them. In these instances some players may feel it was not fair as they may have spent a long time trying to rescue the NPC in question; especially if they receive no positive outcome of any kind.

According to Rouse (2005), players also expect to be able to solve a problem with a reasonable solution that they may have used before; Rouse suggests that designers should anticipate players' actions, either by making alternate solutions available or by giving some feedback if that action they used previously is not valid for this puzzle/problem.

They expect consistency in the world environment and that their actions and results are consistent throughout (Rouse, 2005). There is nothing more frustrating than finding that the rules have changed half way through and you have not been informed, that certain actions that you learnt had a different unexpected outcome or that the interaction changed without notification. This aspect of consistency and understanding the boundaries of the game is

paramount to making the player feel that they have been fairly treated by the game.

4.8.2 Control, Choice and Empowerment

*"According to Sid Meier, a [good] game is a series of interesting choices. In an interesting choice, no single option is clearly better than the other options, the options are not equally attractive, and the player must be able to make an informed choice"(*Rollings and Morris 2000, p.38.)
In most games, you are given a choice of characters to play and a choice of responses in dialogues.

It is important for the player to be imbued with a sense of control and empowerment. In Mass Effects for instance, you are given a choice of response from Renegade to Paragon. Most games give you a choice of response to an NPC in a conversation, sometimes the response will affect an outcome with major implications, other times it has minor implications; but the main aspect of this choice is that you should be able to make an informed choice. Sometimes it suits the game not to give you an informed choice (if you are in a problem solving or question and answer type situation).
Games are full choices, some of the choices made are inconsequential but others can bring the game or quest to a different outcome.

Choices can be as simple as being able to do certain quests when you want to, fight the fights when you are able to (have the skills or equipment), interact with whom you want; have to choice to do or not do a certain task. Of course, often if you are in the middle of a fight you are unable to run away, if a quest has a pre-requisite you are unable to choose it; this is where the designer has to choose, how much choice to give and when and what choices are a valid design option. An open world RPG, by its very nature is full of choices; which quests to do, where to go, whom to talk to. Its design is complex due to the nature of it being even less linear than most games; there are no levels to distinguish one area from another, the player can usually do most of the quests in any order.

4.8.3 Interactivity

According to Sylvester (2013), and Rouse (2005), amongst others, players expect to do rather than just watch (unless it is that style of game). They expect action of some sort, especially those that are used to action. This obviously has to be tempered, having too much going on without a break does not allow the player to explore peacefully, but there must be some interaction (communication with NPC, fight enemies, solve a puzzle etc.) Players do not expect too many cut-scenes to interrupt their game or hours of walking around without anything happening.

This is closely linked to what Birdwell (1999) refers to as Player Acknowledgement. In an RPG, the expectation of interactivity is higher than say a FPS; for instance in Call of Duty, you know there are certain places where the doors are mere graphics, the game guides you to areas you can access and you are unable to access all areas within that level.

An RPG player expects all areas to be accessible within reason; a locked door is acceptable but not a door that is merely a graphical representation of a door. There are of course areas that are not accessible for instance though worlds are vast, there is a boundary beyond which you cannot travel; unlike Earth, the game world is flat not round, so when you come to the boundary of the map, a gentle reminder will tell you, you cannot proceed. Other areas that might prove inaccessible are steep mountains, though even these can sometimes be skilfully scaled. This expectancy causes an issue in design, as even a small village needs to incorporate all the possible interaction of objects, NPC and the environment in general. There is nothing worse than a completely empty village with nothing to do, no one to interact with and nowhere to access. This might be acceptable in an FPS where the aim is just to shoot the enemy, break a few crates, explode a few things and go into the designated areas or buildings. An FPS style game can contain many areas that is just scenery that cannot be interacted with or vast areas that can be seen but not accessed.

4.8.4 Player Acknowledgement

I have used Birdwell's term here, 'Player Acknowledgment', by that he means that the player needs to feel that the world/environment acknowledges him/her. There is nothing worse than walking around in a world where you are unable to interact with the NPCs or with your surrounding especially in an RPG.
Acknowledgement to the player can be in the form of some feedback, either from the objects or NPCs. Birdwell (1999) stated that his team concluded that if the world did not acknowledge the player then the player would not care for the world.

4.8.5 Feedback

This feeds in from the acknowledgement requirement previously mentioned in section 1.8.4, but it was also mentioned in relation to feedback as narrative in section 1.6. Feedback is important to the player, not only in terms that they feel that the world has acknowledged them but also to enable them to understand the rules, the objectives and their progress within the game world. Feedback can take the form of visual or audio; this can take the form of anything from a response from an NPC, gas coming out to show danger, or a chest opening. This feedback enables the player to know if they are on the right track, what they need to do, whether they have been successful or not.

4.8.6 Verisimilitude

This aspect is one I feel is an important factor in designing games, this factor of plausibility. We are strange creatures, in a fantasy game we believe in magic, in dragons but put a motorbike in the middle of this world then the suspension of belief is broken. We are happy to accept certain things in a game, but it has to be within the context of the game world and it has to be believable in that environment. This also goes through to the our character behaviour and that of certain NPCs; if our character or an NPC behaves or is given a choice that is out of character we feel slighted or confused and sometimes annoyed at the design choices.

4.8.7 Flow

Though Csikszentmihalyi's concept of flow was covered in section (5.5.2), it is an important enough to remind ourselves what conditions were required
Nakumara and Csikszentmihalyi (2002) advocate that the conditions of flow included the following:

- Perceived challenges or opportunities that matched existing skills. These have to be not too hard or too easy
- Clear goals and immediate feedback of the action taken. To know if they were successful or not and if any progress has been made

However, this is not the only type of flow one has to consider, the game itself has to flow, by that I mean it has to make sense and be logical; which is no mean design feat, especially as players can play quests in any order.

Players need to blame themselves for failure in a game is one of the theories that Birdwell (1999) and his team came up with; he states that if a game kills off a player with no warning then the player will blame the game and dislike it. If however there are hints of the danger and hints for a way out and the player dies, they will blame themselves and feel they have to try harder so as not to let the game down. If they succeed and are rewarded in some form, they will feel good, not only about themselves but about the game.

This feeling of empowerment that is achieved through the feeling of control, the choices that are available, balanced rewards and punishments, challenge to skill ratio, perceived fairness, appropriate feedback and acknowledgement are some of the things that make a good game and gameplay enjoyable.

In an RPG world, the game is seldom played in a linear fashion. The player can choose where to go, which quests to do, who to interact with; this makes it difficult to port direct step by step instructional design into the whole game (though quests can be designed this way, to a certain extent) and careful consideration needs to be given in incorporating the two styles.

4.8.8 Redefining Fun

A broad definition of Fun was covered Chapter 3, Section 3.5.2., however due its relevance to game design, particularly to the concepts of Aesthetics, it requires further examination.

Fun could be termed as an umbrella emotion that encapsulates other emotions that one deems as fun. These can be anything from fear, surprise, winning a fight, solving a puzzle; they are feelings that make us feel good. But surely fear does not make us feel good? It does if one considers that we as humans like to challenge ourselves to feel alive and sometimes, even in a game the mere fact that we have succeeded in confronting our fears makes us feel good. Some people thrive on the factor of the adrenalin rush, so they will jump out of planes.

As Sylvester (2013), states that emotions are triggered by change and the anticipation of change and that different types of experiences make us feel that we having fun and this change from one state to another is what makes us think that a game is good. Fun then could be considered the feeling one has when the game has good gameplay and this feeling is not necessarily always having positive feelings but the balance between negative and positive. That the level of skill is the right amount for the challenge, that the goal is just about within reach, that the problem is set at our level and that we gain improvement when we try, we feel we have achieved our potential, that we have experience something novel or inspiring, that we have escaped for a little while. At any given time we may feel a gamut of emotions and a range of emotions from frustration to exhilaration. If at the end of the game the balance of experience was more positive than negative than we feel that it was fun; I don't think we would think of it as fun if it was too easy or too hard or if we experience the feeling of sameness.

When we judge a game as good or bad, it isn't just the opposing emotions that are derived from gameplay (win/lose, fight/run away, happy/sad, funny/cringe worthy etc.) that the mechanics unable us to achieve that we take into account, we also instinctively embrace or reject other aspects that fill our senses. In

terms of basic playability, we judge through ease of use, did the mechanics easily enable us to do the actions required, does the style of play suit us amongst other things.

As an example of suitability of style, the Japanese RPG is different to Western world RPG; Western style RPG concentrates on open world, allowing the player to go anywhere, whereas the Japanese style (a great example being Final Fantasy series) concentrates more on narratives and battle systems. Japanese style are often a work of art with epic cut scenes, often making the storyline far more linear, whereas the Western style usually contains few cut scenes, if any. Turn based battle systems usually abound in Japanese style RPG as opposed to the normal real time combat systems found in Western RPG.

The style of play, ease of use of mechanics, playability and the mood it inspires makes us decide on whether it is a good or bad game. The mood of a game can have a profound effect on how we receive a game; this depends on aesthetics, music, story and setting of the world. It is understandable why defining what is fun, is difficult to pin down and defining a good game even harder, but at the end of the day we know it when we see it, feel it, hear it, play it and interact with it. It may be simply to pass the time, it may be to answer an innate need in us for challenge, beauty, novelty, belonging, suspense and maybe when we say it was a fun game, what we mean is, it answered our need at the time and took us on a roller coaster of experiences and emotions.

4.9 Mapping Role Playing Game genre to Learning Theories

The use of RPGs and particularly that of quests found in these types of games, lends itself to exploit the potential that this medium has to offer (Pivec, 2009).

The essence of a good RPG style game is that the player is gently guided to savour the many quests through discovery. This form of guided discovery builds on the player's knowledge of their environment dotted with many forms of clues and guidance in order for them to find the various quests and ultimately achieve the game's goal (Howard, 2008).

Experiential learning model derived from the Constructivism perspective and video games have the ability to give the interaction and feedback required in Kolb's Experiential Learning Cycle as stated by Whitton (2010). This can be done through NPC interactions by direct dialogue or actions performed by them. A good design will give the player cues that can be either audio or visual; a chest that can't be opened because a key is needed would have a text message stating that the player needs a key. Good game design also incorporates the player's progression through the various challenges and quests often in the form of a quest journal; here the player can easily keep up to date with progress and revisit objectives. Books and journals are another way that the interaction can be included; these usually provide extra material and information that the player may need to know.

Siang and Rao (2003) also advocate the use of feedback as an important consideration; they however use the behaviourist perspective to explain how well designed games give immediate feedback so the player learns how to react to certain situations. Sounds and music are often used to warn the player as are visual cues; this is the classic stimuli response behaviour. Here the stimuli can be growls to alert the player that there is a monster, subsequent growls would alert the player, enabling them to react accordingly to the stimulus (Sang & Rao, 2003). This association of sound, music and visual clues that act as stimuli are often used in games; further examples of this may be change of music to warn of danger or the visual clue of smoke like effect or a trap. The responses to these stimuli are in fact learnt responses through operant conditioning (Siang & Rao, 2003), this enables the player to act accordingly. This manifests itself in the form of positive and negative reinforcement; Siang & Rao suggest that whilst the player is learning the appropriate response, feedback should be given immediately during the initial learning process so as to keep the player's motivation high. This positive and negative reinforcement is used in many aspects in games. For instance, in RPGs a player is rewarded for quests they have completed, for NPCs they have helped, using the correct magic or potion or for puzzles solved. They can also find themselves in trouble if they give a wrong answer to an NPC or act inappropriately or cast the wrong magic, eat or drink the wrong ingredient. The punishment or reward should fit the deed and its

appropriate level to maintain motivation; this type of fairness in a game is paramount in good game and level design principles; where challenges are fair and rewards and punishment are given accordingly to the level and complexity of the task. This type of behavioural learning is often used in games in order for the player to understand the basic rules (Siang & Rao, 2003); some genres mainly use this associative stimuli-response technique whilst other types such as Strategy, Adventure and Puzzle types move forward to the realms of Cognitivism (Siang & Rao, 2003) and Constructivism.

It is generally an accepted fact that people learn more effectively when they are active, motivated and engaged, their existing capabilities are brought into play, they are challenged appropriately and they receive feedback (Beetham, 2007). A well-designed game should include these.

RPGs can fall into the realms of adventure and puzzle style game if so designed. Our RPG has elements of puzzle and adventure to enable players to think and process information to deal with new situations. It is important to balance the level of difficulty and challenge in order for the player to feel a sense of achievement and be motivated to carry on playing. This balance between boredom, challenge and frustration is what enable Csikszentmihalyi's optimal flow. Too easy or too many hints leads to boredom and frustration, too difficult leads to frustration; both eventually lead to lack of motivation. This balance of fairness and challenge is one the main principles of good game and level design (Kremers, 2009).

A well-designed game can also give the player as sense of constructing their own outcome; this can be in the form of choices they make or paths they take in the game. Though RPGs cannot be considered to be truly emergent, they have a certain sense of giving the player choices; these choices could be where to explore, who they talk to and how they respond, to how they solve a problem. It is therefore important to give the player this sense of being in charge of their destiny and outcome.

The RPG world therefore needs to have diversity of locations and challenges as well as different outcomes for some of their choices. NPC Artificial Intelligence (AI) that give the NPCs jobs and schedules and differing dialogues depending

on the situation and quest also adds to the sense of immersion and empathy felt by the player towards the world and his fellow companions. The game therefore needs to intrinsically weave learning whilst maintain the essence of an RPG and include aspects of what is considered good level and game design principles by ensuring some of the following important factors.

Some of the factors that are important in design have been discussed in this Chapter and these, together with an open world to discover and immerse oneself in, make an RPG what Prensky describes as a complex game. *"Complex games often have one or several mini-games embedded within them for specific learning purposes"* (Prensky, 2005).

One must also not forget what games are about, they are about fun (Kremers, 2009; Koster, 2005) and it is this fun that is believed to bring about the motivation and engagement that we seek to capitalise on (Zheng, Spires and Meluso, 2011).

In their flow theory research of gamer's experiences they mention Csikszentmihalyi's 8 dimensions. These are:

- Clear goals
- Immediate and unambiguous feedback
- A balance between the challenge of an activity and the skills required to meet those challenges
- Merging of action and awareness (absorption in the activity)
- Concentration of the task at hand
- Sense of potential control
- A loss of self-consciousness
- A distorted sense of time

These 8 dimensions seem to match most of what game/level designers aim for and what the player experiences in playing a well-designed game. Game designers and developers' aim has been to ensure that players are kept immersed in the game by ensuring that players are in Csikszentmihalyi's zone (state of flow) by designing activities that are balanced between the player's

ability and the activity's challenge level, (Kremers, 2009), thus ensuring that players avoid being bored or frustrated.
It is also important that any use of digital mediated platform should have opportunities for dialogue and discussion afterwards (Beetham, 2007), and this is especially true for educational games which will also enable an opportunity for consolidation and integration.

Though aspects such as Challenge, Fantasy and Curiosity, are often mentioned in relation to the design of educational games, the Challenge is often lacking at the required optimal level as advocated by Malone and Lepper (1987), amongst others. The idea that a goal's outcome must be uncertain is also another aspect that makes educators nervous. The Feedback aspect is often misappropriated as meaning step by step scaffolding, rather than just the necessary feedback on the achievement or attainment; good Feedback is a requirement of any well designed game. Fantasy often is bolted on as an afterthought.

The aspect of Curiosity is often either not mentioned or disregarded, possibly because it is often associated with Discovery Learning which now seems to be the subject of considerable debate. Curiosity is now in the forefront of educational concerns and Von Stumm et al consider it as a third pillar of intellect (2011).
Bellotti et al (2011), state that though most Serious Games subscribe to the ideals of Discovery Learning, they feel that this causes problems by declaring that there is evidence that minimal guidance is less effective as well as less efficient than strong student guidance. This is a view also held by Kirschner et al (2006).
Mayer (2004) for instance, argues the point that discovery learning is paraded around. He states that Bruner's introduction to the idea of Discovery Learning in 1961 helped researchers explore different ways of using this from little guidance or pure discovery (where the teacher either gives no help or very little help), to guided discovery (where hints, feedback and coaching is provided) and expository methods (where the students are given a solution).

The problem with this is that though he advocates that pure discovery is not good, Bruner's vision was never about pure discovery but that of guided discovery (Bruner, 2009). This together with the often cited article of Kirschner et al (2006) puts the whole of discovery learning into question. Discovery learning is now considered as pure discovery rather than what the aim of those such as Bruner, Dewey and Piaget envisaged. Bruner was one of the first to coin the term scaffolding (Wood et al, 1976).

Kiili (2005), however states that problem solving through discovery learning would enable players to discover and solve problems, which in turn would enable intrinsic motivation.
It is interesting to note that they mention VARK but fail in this instance to state that there is no evidence that this works, Howard-Jones (2014) states that though presenting information in multiple sensory modes can support learning, reviews and studies have failed to support this approach to teaching.

One has to be careful not to interpret aspects such as challenge, competition or fantasy mentioned above, purely from the viewpoint of educational pedagogy and instructional design paradigms without consideration to the game design principles; otherwise it is easy to lose the essence of the game.

4.10 Summary

Though there is no grand unified theory of game design, a glimpse of game design principles have been considered. The main points were considered in relation to the design of an RPG due to the study's prototypes being based on the RPG genre. The main frameworks and concepts in the area of game design were considered, though by no means a complete list.

Though Sicart felt mechanics and rules were different, mechanics was eventually considered as the combination of rules and actions; rules that the game designer sets and the actions that the player is afforded within the boundaries of the rules.
Dynamics were viewed as the behaviour of the game that were made possible by the mechanics and also enabled various strategies in order to manipulate the various rules in order to derive a particular behaviour.
Aesthetics, though normally thought of as the way an artefact looked and felt from the artistic point of view, was revealed as the emotional responses derived from the dynamics. The Mechanics, Dynamics and Aesthetics facilitate the emotions that create the experience.

Finally the term fun was re-examined in relation to the concepts of emotion, experience and aesthetics; though it still defies definition, it seems clearer that it sits somewhere between gameplay and emotional experience.

The rationale of game genre and engine used for design and development are considered in Chapter 6.

Part III: Methods

"If we knew what it was we were doing, it would not be called research, would it?" (Albert Einstein)

5. FRAMEWORK FOR RESEARCH METHODOLOGY

The study of Games and particularly the study of Video Games have been approached from a wide range of academic perspectives, with either the analysis concentrating on, the design of the games themselves, the player experience, the wider culture of games, ontology of games or the metrics of games (Egenfeldt-Nielsen et al, 2013).

According to Drachen et al (2013), game metrics are quantitative measures that are related to games. This type of data is often collected through some form of telemetry software. They also suggest that most of the telemetry that has been forthcoming is based on user metrics, especially user behaviour; the sub-category of gameplay metrics being the most widely collected in the games industry (Drachen et al, 2013).

Improving player experience is the primary concern for the games industry and some of the important metrics that are required and captured in order to improve the user experience would include aspects of player's actions and how long they spent in session, as well any interaction with the community. This also enables the designers to ascertain any problem areas that may arise, for instance the level of difficulty faced by players may make them give up; if many players are giving up, they know that area needs more balance and can address the issues (Santhosh and Vaden, 2013).

However, because player experience is about the perception of fun, most of the data gathered is often qualitative in nature (Hazan, 2013), though the field of

research in academia and the gaming industry have used both quantitative and qualitative methods; this mixed-methods approach enhances the understanding of this complex field. Hazan proposes that this mixed-method approach would apply equally well to game user research as it has to the field of educational research (Hazan, 2013).

Calvillo-Gámez et al (2010) used grounded theory to in order to come up with Core Elements of the Gaming Experience (CEGE) model which enabled them to study player experience objectively. Other methods of evaluating player experience besides surveys, interviews and simple observations of participants include the use of biometric measurements (Sundstedt et al, 2013; Nacke et al, 2009; Iacovides, 2012).

In relation to Serious Games in education, most research effort has concentrated on the aspects of how games can be used in education or the general benefit of Serious Games as a whole, (Becker, 2005; Prensky 2005; Whitton, 2012), reviews relating to empirical evidence or lack of (Connolly et al, 2012; Blunt, 2007; Girard et al, 2013; Sitzmann, 2011). The methods applied are varied, from quantitative to support or refute findings to qualitative; many of these include pre and post-test designs.
Some researchers have concentrated on finding new frameworks such as CEGE of Calvillo-Gámez et al (2010) to enhance evaluation, others have researched frameworks to enhance the design of Serious Games from game design to incorporate within a learning game framework, (de Freitas & Oliver 2006; Bellotti et al, 2011; Shute et al, 2011). But few studies show the merging of Game Based Learning theories to game development or the methods and tools of the environment in question (Jovanovic et al, 2011).

The Phenomenography approach, a method usually associated with educational research, was used by Whitton (2007), to ascertain players' motivation in relation to games. This was considered as one of the methods that would be appropriate for this thesis and this together with observation is used for the final study as Phenomenography is concerned with how people experience a certain phenomenon.

This initial phase of research took 2 years; within this period as well as the review of literature (subsequently re-reviewed towards the end), an initial focus group was started to initiate the process, a collaborative study with students as designers over a 10-month period was conducted and a survey to aid further understanding the problems were undertaken. During this time, 2 prototypes were developed which culminated in the design and development of the final prototype; leading to the final study discussed in Chapter 9.

Section 3.1 covers the main research approach, whilst section 3.2 begins phase 1 of the research.

In order to design and develop a game that was suitable for both educators and students, it was first important to find out what each side expected. Therefore, the initial question of “What did students and educators want from a Serious Game?” needed to be answered in order to understand the perceptions of each party. It was decided that the best way to kick start the project was to use a focus group.

Section 3.2 introduces details of this and the result of the focus group that led to the initial framework can be found in Chapter 6.

Section 3.3 introduces a collaborative study undertaken with students to facilitate the design of the first main prototype; the development of this design is reported in Chapter 8.

During the collaborative phase, it was clear that a wider survey was required to enhance the understanding of what motivates gamers to play and what motivates them to learn as well as the perceptions of educators in this field.

The survey is introduced in Section 3.4 and the findings and analysis are found in Chapter 5.

These first two main phases were crucial in enabling the final prototype to be developed and the final study to take place.

This final study in the form of a phenomenography study is introduced in section 3.5; the final prototype is included in Chapter 8 and the findings and analysis of the study are reported in Chapter 9 with the conclusion in Chapter 10.

Section 3.6 considers the ethical issues and section 3.7 concludes with signposting the various results and findings of the research.

5.1 Methodology

One of the hardest factors was how to approach the research as a whole and situate it within the methodology, a question posed by Iacovides in situating his research into the investigation of motivation, engagement and informal learning (Iacovides, 2012). Though this research differs considerably from his in respect of the investigations and analysis carried out, his methodology structure is a form that has been adopted as his studies feed into each other; thus the findings and analysis are separated into various chapters. Though his studies feed into the next study, this also differs in that each study was crucial in informing the next phase of design and development.

This thesis draws research from a variety of areas such as Psychology, Education, Games Studies and the Gaming Industry. It is also dependent on prototypes that had to be developed, in order to test the main premise of this whole thesis. "**Research and Development of a Digital Game Based Learning Framework for Education: Designing for Educators and Students"** Though the term Digital Game Based Learning can refer to any type of digital games, the thesis concentrates on what researchers refer to as being motivating and engaging; namely video games. Was it possible to design and develop such an artefact?
It was anticipated that barriers to the use of game based learning would exist. From the Educators' view, this could be due to the perception of what it meant as well as contributing factors such as policies, educational pedagogy and the curriculum. From the Students' view, educational games were either not challenging enough or these games were considered more learning tools rather than games. There was therefore a disconnect between what is anticipated by students to what is actually produced.

It was therefore not only important to understand the nature of the problem but to also explore ways of solving the problem or at the very least to come up with an answer of either why it could or could not be solved. This meant that a variety of research and analysis had to be carried out during the life of the thesis in order to understand and fulfil the requirements. Each phase of the

study facilitates the design and the development of the prototypes, culminating into the final prototype, thus enabling the final study. If one situates this in terms of Software Development, the approach could be considered as Feature Driven Development, in the sense that each phase was driven by the features found in the previous investigations; an iterative and incremental process.

The final study was conducted in order to answer the question “is it possible to design and develop an educational game that is suitable for both educators and students?” The aim of this final study was to ascertain if the design and development succeeded in delivering an educational game or if it was considered a learning tool. Did it meet Marsh’s criteria of encapsulating all the characteristics of games; entertainment games with a purpose as described in Chapter 2, section 2.5.2. In order to ascertain this, it was felt that the use of Phenomenography would be the best approach, as it considers the experience of the participant in relation to the game. It was important that the game was considered as part of the experience; thus the game in itself had no meaning without being experienced and is not considered a separate entity. This approach also means that the investigation explores the variation of a collective understanding and experience of the phenomena in question, rather than just the phenomena or an individual’s perception or experience.

5.2 Phase 1: Setting the scene

It was clear from the literature that not only was there confusion and disparity within the research community of the meaning of Serious Games as seen in Chapter 2, section 2.4, but many educators had a problem either distinguishing what was usable or what was available in terms of Serious Games. It was also evident that students and educators have differing expectations; educators expect educational pedagogy and learning to be at the forefront, whilst students, especially gamers expect it to feel like a game. There is therefore, a disconnect between the expectation of what well-designed entertainment

games could deliver to student-gamers as mentioned in Chapter2, sections 2.5 and 2.5.4 and what educators consider as suitable.

The first initial study was a mere gathering of information to initiate the research and therefore consisted of a very informal focus group. The aim was to ascertain the viewpoints of both parties.
This study enabled the design and the formulation of the initial framework as well as contributing to the considerations on the development platform to be considered.

5.2.1 Design

This was an informal discussion, focus group. The basic question started the discussions, “what do you think an educational game should include?” and “What do you want in a game?” The ideas of the first session were then discussed for input from both sides.
A very basic prototype was developed to show what the medium could bring to those who had never experienced a game like environment.

5.2.2 Research Questions

This initial study to ascertain what educators and students thought of games.
The main research question was “What do educators and students want from a Serious Game?”

5.2.3 Participants and Procedure

In order to understand how educators and students perceive educational games, initial discussions with educators and gamer/students were made informally at first with 5 educators and 5 gamer/students. Participants for this were picked from educators, 3 who taught at two different local colleges and 2 who taught at secondary schools; one from an all girl’s school and one from a mixed school. The educators were shown the original basic prototype for them to see what the medium of an RPG would bring. The student/gamers were in

the proportion of 4 boys and one girl and came from college (3) and (2) from schools.

The focus group was initially comprised of 15 student-gamers and two educators from a college, after the first meeting it was decided that this was too large a group and 3 students were chosen, with 2 educators. The other group had five initially (2 students and 3 educators); but by the second meeting had to be split to 2 students and 1 educator in one group and 2 educators in the next group.

Due to the informality of this focus group, there were many discussions within small groups; one educator and one student and three educators together and 3 students together. Once the main ideas were gathered from each faction, they were tabulated for response from the other faction. It was important to obtain as wide a view as possible and this caused an issue with getting everyone together and as it required differing views and though a focus group should meet all together, it was felt that this splinter group was the best way forward. Once a consensus had been reached on the responses (unless there was only one response), this was collated in a table format.

The results and analysis of this led to the initial framework as discussed in Chapter 6.

This also led to an initial prototype, designed collaboratively with students as represented in Phase 2a in the next section.

5.3 Phase 2a: Collaborative Design

This study initially started as a focus group to ascertain students' perspective on educational games but developed into a working relationship with media students helping to design aspects of the world and this co-operative working relationship added a new dimension and depth to the research.

In an attempt to harness the potential of Game Based Learning (Barab, 2005), students from a 1st year BTEC Game Design (Media) course at Dudley College

were asked to help design elements of the Main World. This also gave the opportunity to the Game Design lecturer to be involved and for the students to learn some aspects from my own design and development process. It seems a good solution all round; on the whole, eager participants, 2 extra helping hands and a grateful researcher.

While Prensky states, “Students as Designers and Creators of Educational Computer Games Who else?” (Prensky, 2007), there has been little research on the involvement of students in educational game design. Working with students as well as educators may help us understand how these games should be designed for effective learning (Price, 2009).
With this in mind, my student focus group were allocated to become designers to help design parts of the main game world.

5.3.1 Design

The research design for this small but complex study meant that it required the use of a range of research methods. The aim was as a researcher, to think about the game elements and design concepts that needed to be adjusted or even completely redesigned in the light of some of the findings. This meant that changes and adaptations of the methodology process of the study were required throughout this phase. “Qualitative research therefore is not a single entity, but an umbrella term that encompasses enormous variety” (Punch, 2011).
The design stage was a slow iterative process between the designers and researcher to ensure that content, game design principles and ethical issues were addressed.
The guidance was required for aspects of game design concepts as well as including the educational elements.
This part of the study could be considered as Action Research as it enabled insight in order to better design and develop the first main prototype. As Stringer (cited in Punch, 2011) states that in order to “engage in careful, diligent enquiry, not for the purposes of discovering new facts or revising accepted laws or

theories, but to acquire information having practical application to the solution of specific problems related to their work" (Stringer, 2004:3) cited in Punch (2011).

5.3.2 Procedures and participants

The group was composed of 15 First Year BTEC Game Design students from Dudley College. In order to make them feel as they were getting something in return, they were asked to do various tasks in Working Together Key skills. The sessions were 1 hour each week over 10 months, with the aid of the researcher, a key skills tutor and the intermittent intervention of the game design lecturer.
The choice of media students as opposed to computing ones was felt to be an important aspect in the design process; media students were more likely to concentrate on aspects of the storyline, quests, characters and aesthetics rather than putting most of the emphasis on pure game mechanics and coding of the game.

5.3.3 Results and Analysis

Though the conclusion of this study relies on the author's judgement, the study was conducted as an experiment and followed all protocols for such a study. Bias and subjectivity, vested interest in the results, generalizability and ethics were factors that needed to be taken into account (Punch, 2011); these are considered further in section 5.6.
The results of the development from this collaboration are included in Chapter 8.

5.4 Phase 2b: Survey

The initial focus group discussion enabled the design of the framework, discussed in Chapter 6 and the first main prototype in collaboration with students discussed in section 3.3, with the developed outcome shown in Chapter 8. However, as the collaborative design proceeded, it was clear further investigation was required.

5.4.1 Design

The requirement of the questions was as a result from the initial focus group, initial basic prototype and from the start of the collaborative design phase as well as from the literature

The aim of this was to gain an insight to the use if any of educational games in the classroom, the genre of games played and their motivational factors.

The questionnaires used in the survey and the data gathered from the survey can be found in Appendix1. Two different surveys were used, one that targeted educators and one that targeted students. Some of the questions were the same for both types of participants where applicable.

Though the question of what was perceived as crucial in the design of educational games in terms of the balance between fun and learning was important, it was also important to ascertain the types of games that both types of participants played.

The factor of motivation was another aspect that needed addressing. Were students motivated by similar factors in learning as in their gaming? Did the educators' views on what motivated students' in their learning correspond to what the students felt was most important? Aspects of the elements that engage and motivate gamers were covered in Chapter 3.

5.4.2 Research Questions

Though some of the details gathered were important to give an overview of demographics and subjects taught, the main aim of the survey was to ascertain the following

- Use of Video Games by Educators
- Design of an educational game
- Motivational factors for learning and for playing a game
- Genres of games played

From these the main research questions that needed to be answered were

1. What are the reasons for not using Video Games? (Educators)

2. What should be focused on in designing an educational video game? (Students and Educators)
3. Was there a difference between Educators and Students view on what should be concentrated on most when designing educational games?
4. What are students' motivational factors for learning subjects?
5. What do educators perceive as students' motivational factors for learning subjects?
6. What are the most and least important motivational factors for playing video games? (Students)
7. What Genres of Games are played by Educators and Students?

5.4.3 Participants and Procedure

A preliminary survey was conducted through Survey Monkey with 52 educators and 88 students.

Questionnaires were deployed to the two distinct groups; through Facebook, email and the TES site. Some of the questions were the same for both groups; others were based on the relevancy of the group. Some schools were not allowed to access Survey Monkey and therefore the questionnaires were sent by email to be distributed to the students. Facebook was used for Facebook friends to pass on the link to any educators or students.

Due to the nature of the research it was necessary to use purposeful sampling for the student population. Participants were asked to pass on to friends through Facebook. This method was also used to ask participation of some students from teachers working in secondary schools. Though this method used purposive and snowballing method, (Cohen et al, 2008) it was deemed necessary in order to obtain the type of participants required and to gain access to those that would be difficult to access (secondary school students).

The participants were Student N=88 and Educators N=52. The main results and analysis are included in Chapter 7, the following details concern the demographics of both students and educators.

Student Demographics

Details of demographics were collected for students in order to ascertain where the students studied shown in Figure 5.1, and the age group shown in Figure. 5.2. In terms gender 21 (24%) were female and 67 were male (76%)

Educational Establishment

85.2% (75) of the students were from FE Colleges. 9.1% (8) were from Universities, 4.5% (4) from Secondary Schools and 1.1% (1) from Not Applicable.

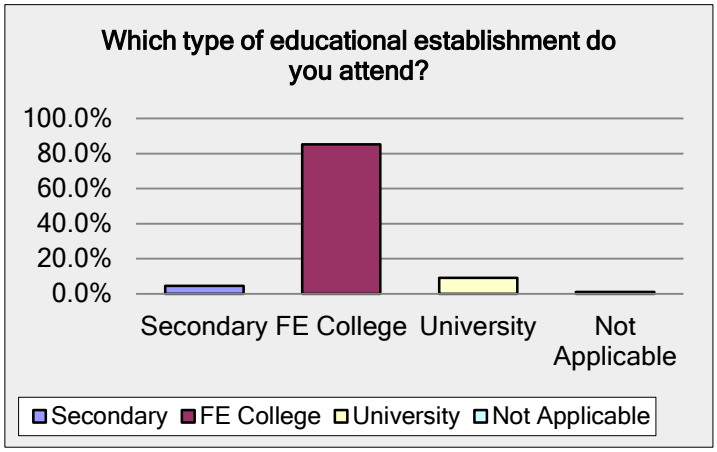


Fig. 5.1: Educational establishment

Age Range

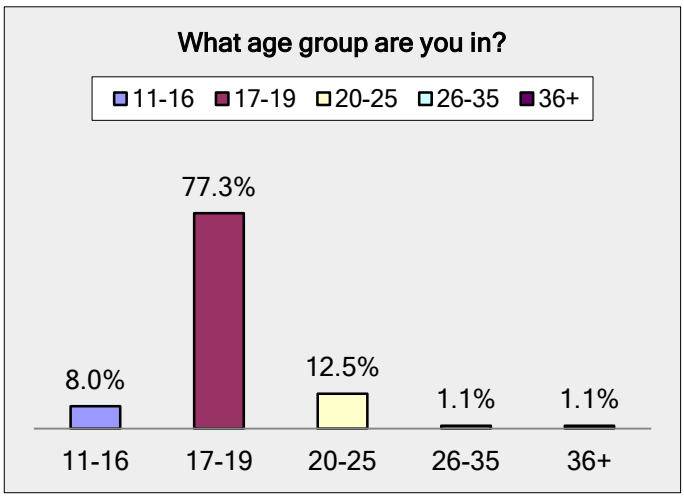


Fig. 5.2: Student age group

The age range showed that 68 (77.3%) were aged between the ages of 17-19 and 11 of the participants were aged 20-25. There were 7 from the age range 11-16. There was 1 participant that was in each age range of 26-35 and 36+. It was not surprising to find that the age range of 17-19 was the highest as this is the average age group for those attending FE colleges.

Educators' Demographics

Here it was felt that where educators taught was important, as well as the subjects. Gender and age group had been a consideration but was left out. In this instance, it may have been useful but it was felt that it could stop people completing the survey as it could be construed as a sensitive issue by some of the practitioners.

Figure 5.3 shows the results of the establishments and fig. 3.4 includes details of the range of subjects taught by the participants.

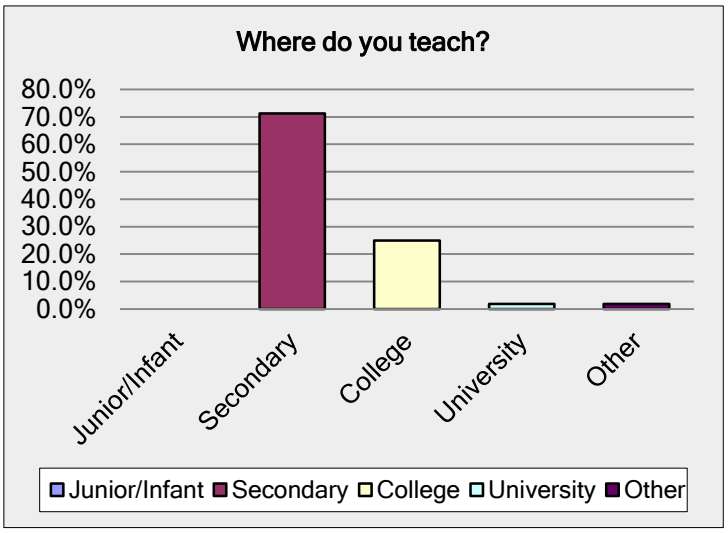


Fig. 5.3: Educators' establishment

The results in Figure 3.3 for educational establishment, shows that they were mainly from Secondary Schools, at 71.2% (37) as opposed to the student participants of 4.5% (4). Educators from FE came to 25% (13). Though Junior/Infants were included, there were no participants who taught there. There was 1 participant who taught at University and 1 participant who answered "Other" and they stated they taught at a hospital.

It was felt that it was important to know the range of subjects that educators taught; this could shed light on any influence of future variables. This was an open ended question and the answers were collated to appropriate subject

areas.

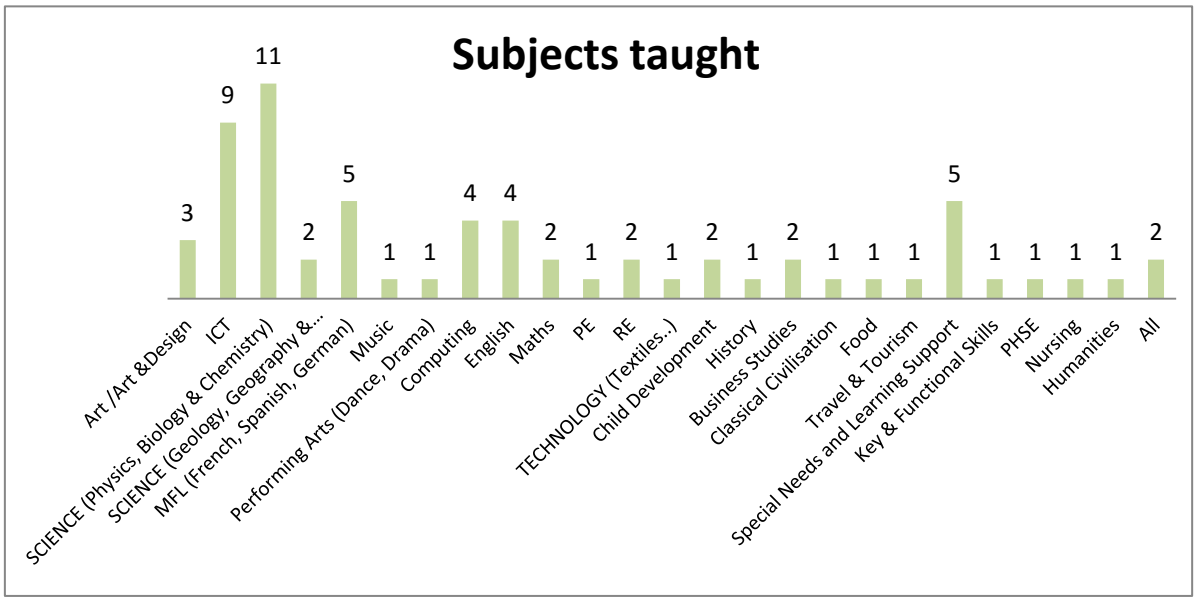


Fig. 5.4: Subjects taught by educators

Figure 5.4 shows the range of subjects taught by the educators; as some educators teach across a range of subjects, they were asked to state them. There were 52 participants with 65 responses as some taught more than one subject area. The highest number was 11 teaching the Sciences and 9 teaching ICT.

Two of the educators put all subjects and this was shown separately as it was difficult to find exactly what “all” meant.

5.5 Phase 3: Phenomenography Study

This part of the research aims to ascertain the views and experiences of educators and students in a Phenomenography study of the game that has been designed and developed; how different people experience, understand or conceive the artefact in question. It is not focused directly at the artefact but at the variation of people’s perception of understanding and experiencing it (Larsson, 2007).

Phenomenography is concerned with how people experience a certain phenomenon.

Though it is similar to Phenomenology, in the fact that they are both concerned with a person's experience of their world, there are some differences. Phenomenography is interested in the collective meaning, whereas Phenomenology is interested in the individual's experience. It is considered an interpretive research approach. Another similarity often mentioned is that of Grounded Theory.

Phenomenography is a "second order" perspective, where the world is described as it is understood (Marton, 1981; Richardson, 1999), whereas Phenomenology takes the "first order" perspective where the world is described as it is (Orneck, 2008).

Another important distinction is the game/tool is considered as a distinct object to the person in Phenomenology, whereas in Phenomenography, the tool itself cannot have meaning by itself without being experienced. It is to characterise variations in people's experiences (two people may have the same experience but view it differently). Therefore, the investigation is not interested in the phenomenon itself but the variation in experience and understanding of the phenomenon. It is also important to understand that there is a relationship between the actual artefact and the person; one cannot be considered without the other. (Marton, 1981; Richardson, 1999; Larsson, 2007)

It is considered sufficient to have 15-20 participants for this type of study, however a number smaller than this would be considered acceptable as long as the variance of experience is found (Bruce et al, 2004). Having more than 20 becomes logistically difficult to manage.

This study aimed to explore how video games could be designed and developed for education that could fulfil the needs and expectation of both students and educators. This part of the research aimed to ascertain the views and experiences of educators and students in a Phenomenography study of the game that has been designed and developed; how different people experience, understand or conceive the artefact in question. It is not focused directly at the artefact but at the variation of people's perception of understanding and experiencing it (Larsson, 2007).

5.5.1 Design

The phenomenography study was conducted with educators and students; these were recruited from recent graduates, gamers of various ages and educators (from college, school and university). Most of the participants were known to the researcher apart from three, as the sampling had to be purposeful. This study had to have a sample of the correct type in order to make the study viable. It required that there were gamers (Casual or hard-core and a fair balance of these), it also required that there were educators (some who would play and others who were not gamers in any form). Because I needed to ensure that the platform of testing the game was the same, the same computer had to be used; it was therefore considered not to give out the game randomly to test. I also needed to interview the participants and observe most of the proceedings myself for any extra data that I might be able to obtain. It is unfortunate that due to the nature of the study that participants had to either come to me or I had to go to them with the hardware and this very nature meant that I had to have a purposeful sample overall.

The way the game depended on the original game and the additions of other modifications to help make it as polished as possible meant that it would have been very difficult to replicate the experiment. The participants would have to replicate and set up everything the same way; unless they were used to setting mods with the various libraries it would have not worked. The study also required that the participants were interviewed, which made other avenues difficult.

5.5.2 Research Questions

The study was two- fold, to ascertain the players' perception and experience but also to ascertain what it is that interests players' in this type of genre.

It was important that the main aim of this was not just concentrating on the actual artefact itself, but whether the participants ended up thinking of it as a game or as a learning tool and their experience of it.

To answer the main research question: ***Is it possible to design and develop an educational game that satisfies the needs of both educators and students?***
The following questions were asked.

1. What did you think of the educational game? What was your experience of the game?
2. What would you think if the game only had the puzzles in the rooms and nothing else? How would you feel if the rest of the world was removed to only leave the rooms and puzzles?

If the participant was a gamer, an extra question was also asked in order to understand the type of player they were. This was not part of the main study but additional to obtain extra information and to supplement the study.
What types of players are there in Role Playing Games?

The questions were.

1. What do you like doing when you play an open world RPG like Oblivion or Skyrim?
2. Precision and morality question. This depended on how they answered the first question

The very nature of a phenomenography study is to allow the participant to speak freely and depending on their answers, different ways of asking the above were used. It was important for the researcher to let the participants speak freely, to give them time to respond and not to steer the interview. However it was also important that the researcher had some answer to the main question.

5.5.3 Participants and Procedure

All participants were asked to complete a consent form consisting of an information sheet outlining the purpose of the study (Appendix 2) and their right to withdraw from the study anytime.

Food and soft drinks were provided at all three venues; the university, the researcher's home and a friend's home.

The sampling was purposeful as it required gamers as well as educators. An email was sent out to request for participants from the University and only targeted those recent graduates to ensure validity and no causal effects and did not include the researcher's current students. Participants also included two university lecturers and a researcher.

Participants were chosen primarily as gamers and non- gamers, student and educators. There were originally 20 participants, but some either did not participate fully or were not interviewed in the final phase due to circumstances, these were not included in the study. The final total for the study was 17.

Amongst educators, there was a difficulty in finding gamers and only one could be considered as a gamer and though in education was not a qualified teacher.

Educators came from:

- University (3)
- Secondary School (1)
- College (1)
- Primary (1)

The games design lecturer who was due to participate was unable to do so because of long term illness, not counted in above.

Amongst non-gamers, students or those who had recently graduated; gamers and non-gamers were chosen.

Gamers that were chosen were a mixture; students or recently graduating students and those who were just gamers. Gamer participants had a wide range of ages, capabilities and areas of expertise. Some of the mature participants were also parents.

It was important to have a wide range of ages, capabilities and area of expertise. One session consisting over a whole evening took place at a gaming party that a friend had every Friday evening. The willing participants consisted of 4 and included 3 who were not known to the researcher. Two of the participants were over 30 and 2 were year 11 students, who were there with their fathers.

Consent was sought from both sets of parents to ensure compliance with ethics.

The third location was at the researcher's home, where 5 people participated in the study; these included 2 sets of couples and one other; three educators and two gamers. These were conducted on 3 separate evenings.
The whole study was conducted during a period of 3 months.

Once participants had completed and signed the consent form, they were asked to play the game.
In order to ensure that all had the same experience, the same machine was used; this included all the hardware, including headphones for those who required it. A book, 30-second Elements (Ed. Scerri, 2013) was also provided as the game included some chemistry puzzles; the periodic table was also included in game.
Participants were given the choice to play by themselves, with others or just observe and play certain elements. All participants had a go apart from one who actually just observed but interacted with the player and contributed to solving one of the puzzles. This was important because some were non gamers and the aim was to see their perception. Some people just played half the game with an observer and then swapped, whilst others played the whole game.
Most talked to each other and tried to help each other and nearly everyone with the exception of one looked at the book. A lot of the participants had to be nudged into using the book when they got stuck, even though they were initially advised that the book was available to them or told to find the existing clues in the game (even the hard gamers did not think of always looking for the clues).
Everyone who participated did so, for a minimum of 30 minutes to an hour of exposure to the game. One player spent one and half hour on the game.
Once the participants had either played the game separately or collaboratively, they were then interviewed. The interview was recorded and later transcribed.
Details of the findings and analysis are included in Chapter 9.
Participants for the question relating to experience of game is shown in table 5.1.

No	Gamer	Field/expertise	Comments
1	Y	Computing (RG)	
2	Y	Game Design Student (RG)	Used Oblivion for software development module
3	Y	Computing Student (RG)	Not played for 10 yrs.
4	Y	Computing/Game (RG)	Used Oblivion for software development module
5	Y	Simulation/UDK	Researcher/developer/demonstrator
6	Y	Just completed GCSE	
7	Y	Programmer	
8	Y	Year 11	
9	Y	Year 11	
10	Y	Gamer for 20 years	
11	Y	Gamer for 20 years	
12	Y	Gamer	Half-done but some comments given but not for 2nd half (Player type)
13	C	Computing Student (RG)	Xbox only, limited
14	N	Educator/Media/Art/Web	
15	N	Educator	
16	N	Educator/ Science/STEM	
17	N	IT in Education/ Trainee Teacher	
18	Y	Gamer	Finished game (Observation only)
19	N	Educator/Child Development	Finished game (No interview/not observed fully so not included at all)
20	N	Educator ICT	Secondary girls school NOT DONE

Table 5.1: Phenomenography Study Participants

The final interview phase of the study included 17 participants. Though 19 out of the original 20 did participate, 2 were not interviewed, and only 18 were included in the observation discussion of the study. The details of this study are included in Chapter 9.

5.6 Ethical Considerations

Ethical consideration in research can be complex; it is especially true where it involves participants. Adding the element of educational establishments adds a further dimension that has to be considered. One has to be mindful not only of the rules and code governing the integrity and ethical concerns of the research itself, being mindful of the participants but also take into account any requirements and concerns of the educational establishments. The BERA (2004, 2011) ethical guidelines for educational research were used as a guiding set of principles that informed this thesis and research. Aspects to be considered in regards to participants included, voluntary informed consent, openness and disclosure and the right to withdraw.

Ethical approval was sought from the University of Worcester for the research. As the collaborative study was conducted with Dudley College, ethical approval was sought to ensure that the research conformed to their rules, a gatekeeper was also present as the research was conducted over 10 months for 1.5 hours a week, details of this are included in section 3.3. Approval was also sought and gained for a local secondary school in Birmingham for the studies, but due to unforeseen circumstances, the school was unable to continue participation after the initial first contact, though two of the teachers participated during the initial phase and helped with snowballing method for the survey. The college participated in Phase 1 and Phase 2a. A mixture of students and educators were used for Phase 3. In each case participants were informed of the nature of the study and its goal. For the main study of Phase 3, participants were also asked to complete and sign a separate consent form. These participants were from various locations and required to participate in playing the game and then were interviewed.

Whatever methodology one uses, one has to consider the internal validity and causal effects. Bias and subjectivity, vested interest in the results, generalizability and ethics were factors that needed to be taken into account (Punch, 2011). He suggests that these can be minimized by *"bracketing"* and involvement of colleagues who can exercise as *"watching brief".* Due to the

weekly involvement of the researcher in the collaborative design stage, these concerns were covered by the Game Design and Key Skills lecturer acting as the *“watching briefs”.* The ethics issue is always a concern in education, consent had been received from the college but other ethical issues needed to be dealt with. This primarily concerned the students’ welfare and also the researcher’s own validity of the research.

Internal validity is a threat that always rears its head in social research. Influence of the participants is part of the problem but in this instance guidance was also a necessary requirement (Felicia, 2011), collaboration between the group and the researcher was unavoidable. Ethics is another big issue with educational research but concerns here were twofold; not only of the ethical consideration of the actual study but also ethical issues of the design that students may come up with. With this in mind, there was option but to get involved. This may mean the general approach could be considered as Interpretive and therefore susceptible to lack of rigour; however in this type of study it was imperative that the researcher was there to help guide students as well as observe and record findings. Left to their own devices, students would have carried on designing some unsuitable aspects; for instance one would have found a well-known celebrity TV chef battered in a kitchen. Students felt that fighting of some sort had to included, our compromise was to allow fighting rats and skeletons in dungeons only.

The guidance went beyond just ethical issues; it was required for aspects of game design concepts as well as including the educational elements.

5.7 Reporting of results and analysis

The phases of the research were interspersed with the design and development of the prototypes, leading from one study to another to inform each phase. This culminated into the final study and evaluation of the last prototype.

Chapter 6 outlines the initial phase 1 study, which enabled the consideration and design of the initial framework which also informed the choice of engine and genre for the rest of the study.

The collaborative study of phase 2a enabled the development of the first main prototype and is reported in Chapter 8 along with the final prototype.

Chapter 3 informs the reader of details on motivation and flow found in games, which aids the interpretation of some of the salient points of the phase 2b survey findings of Chapter 7.

Chapter 9 reports on the final phase 3 phenomenography study which was facilitated by the development of the final prototype discussed in Chapter 8

5.8 Summary

In such a field that is both multidisciplinary and interdisciplinary, it is not surprising that different research methods have been used.
In order to ascertain whether a suitable framework could be designed and developed, the research took on a three-prong attack to help solve this question.

The methodologies were a mixture of quantitative and qualitative. This mixed method was invaluable in order to facilitate the different phases of the study, which in turn informed the design and development of each phase of the game.

In phase 1 it was necessary to utilise a focus group to instigate the initial study in order to ascertain what Educators and Student gamers wanted from the game. This qualitative approach, though informal was necessary to get the initial requirements for the first prototype.
This was supplemented by the survey of phase2b, which looked into both Educators and Students' perception of Learning and Games. A quantitative approach was used in order to find out the types of games played and what each party considered as important factors in playing and the design of games. This also served to ascertain each party's perceptions as regards to similarities or differences of motivational factors for learning and for playing a game. The statistical analysis carried out during this phase not only strengthened the study but also helped define and refine the next phase and prototype.

The Collaborative study of Phase2a employed a qualitative approach, could be considered nearer to Action Research, as it involved the participants, the artefact and the researcher. This proved useful to gain further insight into what student gamers expected. The details of this study are covered in Chapter 8, Section 3.
The Phase1 and Phase2 of the studies, contributed in informing the design and development of the final prototype, thus enabling the final study of Phase3.
Phase3 was the culmination of testing the prototype with participants in a Phenomenographical study to evaluate the final prototype.
The approach was ideal in order to discover how the participants experienced the final prototype; how different participants experienced, understood or conceived the artefact. This approach was not directed at just the participants or the artefact, but rather at the variation of their perception of their understanding and experience.
The design and development of the final prototype is discussed in Chapter 8, Section 4 and Section 5. The result of the evaluation of the Phenomenographical study is found in Chapter 9.

Part IV: Analysis and Results

"There is an enormous chasm between what kids do for fun and what they are required to do in school……Imagine these two worlds united" (Shute et al, 2009)

6. What do Educators and Students want from a serious game?

Phase 1 of the study was to gather the initial requirements from Educators and Students in order to formulate an initial plan and design. This phase also considers the technology required.

Section 1 situates the set-up of the whole study and considers the use of a Role Playing Game as the main genre choice for the initial prototype. It also introduces the focus group study and the initial findings for phase 1 of the study as mentioned in Chapter 5, Section 2.

Section 2 introduces the focus group study, which was an initial informal discussion with educators and students.

Section 3 considers a conceptual framework to incorporate both student and educator requirements derived from the analysis of the focus group. This facilitated the cycle of design and development of the prototypes throughout the thesis.

Section 4 reflects on the choice of engine for the prototypes, concept of modding and discusses the final choice of the Oblivion engine and its affordances.

6.1 Setting up the study

In order to initiate the studies it was important to understand the perceptions of Educators and Students with regards to Game Based Learning and Serious Games and their requirements and desires for such a game. Phase 1 of the study (as introduced in Chapter 5, Section 2) was therefore set up as a focus group to ascertain initial requirements, determine the type of technology that might be used and to formulate a suitable framework.

A very basic prototype was developed to show what the medium could bring to those who had never experienced a game like environment. This simple prototype was built in Bethesda's Elder Scrolls IV: Oblivion game (Bethesda Game Studios, 2006) and shown to educators to show them a simple open world. This only included terrain, a horse, one character and very little else. Those who had never played were also shown a sample of the original video game to help them understand the concept of an RPG. At this point I had hoped that I would be able to use an RPG framework but no formal decision had yet been made, however all those involved were told that this might be the case.

6.1.1 Choice of genre

It was important to have a genre that could appeal across a broad range of player types and could fully utilise all the best that the medium had to offer.

First Person Shooter (FPS) games are probably the most well known genre of games especially on the consoles as there are more of these types available; this genre is also more suitable for playing online. The most well known Massive Multiplayer Online Game (MMOG) is World of Warcraft, which is in the style of an RPG genre. PC gamers tend to play a mixture of action adventure, FPS and RPG.

The Tokyo Game Show (TGS) of 2015 had revealed a list of trending genres. Action was the most represented genre at the show, followed closely by RPG and simulation (Williams, 2015).

Though action seems to be the most represented above, action games as a genre can include many sub-genres such as shooter games, fighting games and platform games.
The use of FPS was discounted, as it was felt it would not allow scope for the true potential in designing an educational game and it could also limit the type of players that enjoy this type of game. FPS genres tend to be:

- Go to a level
- Get mission
- Fight and kill
- Pick up loot
- Get to the main boss
- Fight and kill

This type of genre is difficult to incorporate learning outcomes; games like Math Blaster use this type of shoot, then answer some questions and shoot again.
The RPG genre is able to incorporate some of the best elements of most genres. It is able to facilitate the design and incorporation of puzzles, action, adventure and elements of first person shooter. RPG genres include quests that enable the player to control one or two characters, often set in vast worlds of fantasy. Though most of the proponents of Serious Games, feel that applying the concepts of behaviourism alone to Game Based Learning is not the way to go, as the old Edutainment showed, there are those who purport to using the Gamification way of using badges and reward system as the way forward
It is understandable and sometimes necessary to use this type of rote learning game; they are easier to design and easy to deploy. Brain training games are an example of this.

A report in April 2009 from the Medical Research Council, Cognition and Brain Science Unit in Cambridge showed that brain training games do nothing to improve thinking or memory. Research shows that the average age of a gamer is now 35+ and that women now tended to play games nearly as much as men (Kirriemuir & McFarlane, 2004). However, these games tend to be considered social games like Farmville, Brain Training, casual games or Wii fit type of

games. Ask a gamer what type of games they play and they mean videogames (console or PC). It is the use of videogames in education that the main domain of this research will concentrate on.

Pivec states that though there is no empirical evidence to show that brain training games work, he advocates the use of RPG as a means to benefit and aid learning. He further adds that the use of drill and practice does not exploit the potential that exists for education that is found in the game playing environment (Pivec 2009).

A subsequent report in the Science section of the Guardian in April 2013, Dr Adam Hampshire one of the original researchers who developed the MRC tests of the 2009 study stated that those who had regularly used brain training exercises showed no advantages in any form of intelligence to those who did not. He did however state that those who played video games regularly seemed to better in their short-term memory and reasoning.

"This is an interesting finding because it is really counter to the general zeitgeist that video computer games are bad for us whereas we should all be investing in brain-training devices," he says, *"We might just be better off spending our money on a new videogames console!"* (Hampshire, 2013).

6.1.2 Combining Game and Education

Two schools dominate the view of games in education. It is either considered, an engaging motivational tool (Squire; 2001), or as trivial, unsuitable, fostering aggression and social isolation (Anderson et al, 2004).

Students generally do not find commercial educational games fun to use or engaging; some say they are not challenging enough (Klopfer, 2009; Kirriemuir & McFarlane, 2004; Prensky, 2005). Often times the design of an educational game is heavily influenced by the learning content at the expense of the essence of the game's immersiveness and flow (Fabricatore, 2000).

So how does one start to consider the design and development of educational video games which meet the needs of both educators and student gamers? One that could support a range of learning strategies for educators whilst incorporating the game design principles required to engage students.

The design has to ensure that it acts as an expert together with the teacher to provide Vygotsky's scaffolding. It therefore needs to incorporate a challenging environment with enough scaffolding to make it achievable (Shaffer, Squire, Halverson & Gee; 2004). Other aspects that are important in current GBL are Motivation and Engagement, it is generally an accepted fact that people learn more effectively when they are active, motivated and engaged, their existing capabilities are brought into play, they are challenged appropriately and they receive feedback (Beetham, 2007). A well-designed game should include these.

However it is also important that any use of digital mediated platform should have opportunities for dialogue and discussion afterwards (Beetham, 2007) and this is especially true for educational games which will also enable an opportunity for consolidation and integration.

The game has to be able to support a range of learning strategies whilst incorporating the fun element. It also had to consider the needs of both educators and students whilst at the same time maintaining Mihaly Csikszentmihalyi's flow mentioned by Prensky (2005) and ensuring that elements do not appear hooked on (Klopfer, Osterweil &Salen; 2009).

This combination of video game and learning has to ensure that learning is fun, challenging and intrinsically rewarding. It is important to embrace what game design principles have to teach us and to embed learning content naturally in a game, (Fabricatore, 2000; Habgood and Ainsworth, 2011) and not to miss the full potential that the medium has to offer us; otherwise it is what Fabricatore calls the "going to the groceries store around the corner with a Ferrari phenomenon", ending up with a product poor in gaming experience (Fabricatore, 2000).

6.2 Focus Group Discussions

In order to understand how educators and students perceive educational games, initial discussions with teachers and gamer/students were made informally; this was an initial study to ascertain what educators and students thought of games.

During the development of the first main prototype, the Educators' points of views was summarised and transcribed to include the salient points. Two, Non Player Characters (NPC) played the character of student and educator, voices were recorded for the NPC and the scene was recorded in the game and then used in a video to show at a local conference at the University of Worcester and as part of a presentation at iGBL Conference in 2012 in Ireland. Details of this prototype are considered in Chapter 8.

Fig. 6.1: Snapshot of NPC discussion

The informal discussion has been mapped to the tables in Table 4.1 showing what student gamers felt should be in a game and the summary of some of the educators' points of view and Table 4.2 shows what educators felt were important and the reaction of some of the student gamers to their viewpoint. The comments were added by the researcher as notes and it was felt useful to keep them in.

6.2.1 What Gamers want

Gamers	Educators' point of view	Comments
Fun	Okay, but after you have learnt something	Fun and learning are not mutually exclusive
Motivating	Of course	We don't know what motivates everyone, but the gaming industry seem to know what motivates gamers
Tangential/Informal Learning (sometimes)	Well only if it is really relevant to curriculum	Having students to read round the subject is something we all want; if we can inspire them to pick up a book afterwards or Google some facts then that must be good
Open World to Explore	Time wasting	Need to ensure that gamers have this but during lesson time we have to ensure they are focused
Learn in my own time	Must remain focused, but I agree with the concept	
Happy to fail and go back if I need to	Not allowed, the game needs to ensure that it supports the student and therefore could not have been made correctly	Main game has to have failure possibility
Good storyline	Not that relevant is it? If it's English then yes, maybe you could get the students to write a story	Yes it is
Good characters	Yes, I can see what you mean but the main aim is to educate not entertain	Has to be both
Believable	Must have real facts	Has to be both. Believability in the game is a prime consideration but not always necessarily factual
Good challenging quests	Yes but must be fairly achievable for all levels	A lot of educational games are just not challenging enough
Different levels	Agree with that	Differentiation
Varied types of challenges	Quiz and sims. What else is there, how else can you check learning? Oh could you have open ended input, that would be good	Main game has to be more innovative
Rewards	Agree with that	Motivation!

What Gamers want (continued)

Gamers	Educators' point of view	Comments
Skill progress	Definitely, you do mean their curriculum achievement don't you?	Motivation! Therefore it has to also to do with main game
Challenging but not impossible	Not too or they won't all be to do it	Yes very challenging but possible, that is part of the fun. Gamers will put the effort in if they are engaged
Varied parts to explore	Will waste too much time, it is only a 45 minute lesson you know	Main game has to be varied as does the education part or it will end up being samey
Good graphics	Not worried about that, anything is better than what we have. They'll be thrilled with whatever you give them	Gamers are discerning
Good overall game mechanics	Not sure what you mean. But I hope you mean it follows Learning Theories and Sequence of Instructions	
Know what I've got to achieve	Well that I agree with, must know your goals	Gamers like to know their goals, but are not afraid to look for it
Know when I've completed a quest	Yes. More than that can we have a print out of the achievements with the levels and feedback?	Achievements are just as important for both gamers and students
Would be good if I could interact with characters	Yes, that would be good if they could all ask questions and help if you are stuck	Turn it all into a classroom and you spoil their domain, it then becomes yours not theirs
Would be good if the characters did not just stand still	Time consuming to look for them and does it matter that much	This helps the feeling of flow and immersion
Flow	Oh yes, but as long as it is Instructional Sequence	A good game has one. This the essence

Table 6.1: Details of focus group discussion from Student Gamers

6.2.2 What Educators want

Educators	Gamers' point of view	Comments
Teach something relevant to curriculum only	You are going to taint gaming. It won't be a game if you can't have fun	Now you are in my space.(Hollins 2010) Don't pretend it is a video game if that is what you are doing and expect the kids to be wowed after the first session
Some extra informal learning	Happy with that as long as it is interesting	
Blended learning	Depends on the teacher	
All curriculum based	You gotta be kidding! Where's the fun	
Focused and timely	I go to class for that	
Follows the Instructional Sequence	Oh no a lesson plan	This is actually one of the most important aspects for an educator but it has to be subtle
Aims and objectives	Yeah, I can relate as long as you don't make it sound like a lesson	Games are full of aims and objectives
Simple and easy to use	Now, I don't think that will work. You obviously haven't played a game	Too simple and you will lose them
Use of educational pedagogy	Not sure what that means	Actually the gaming industry is really good at keeping the gamer motivated, inspired and they have to learn the skills in order to proceed. A good game will always have these intrinsically woven in
Input	If the mechanics are good, this should be fine. But don't bore me with this. I could just read a book, real one I mean or pay attention in class	Input should be varied and here blended /pervasive learning would be ideal
Challenge (quiz or problem)	I think you need to use a bit more imagination here	Games nowadays are full of innovation, we have a lot to learn folks
Feedback	Yea, I like feedback too, and you know what I don't mind if you tell me I'm rubbish at it. It's only a game. I've got a chance to improve, right?	A lesson to learn here, don't treat them like kids. In their world they are in charge and grown up

What Educators want (continued)

Educators	Gamers' point of view	Comments
Assess learning	Now you're kidding. If you've got the game mechanics right and I have completed the task surely I have learnt something. Retaining it is another matter. But if you make it interesting enough I might follow it up, depending on my mood. And depending on who I am on that day might even discuss ways to solve it with others	If you have to, you could give them a test afterwards. Some internal game testing is fine, but forums, discussions could take place to reinforce learning and understanding. This should not be an exercise in rote learning but more exploration and problem solving, sparking their interest and maybe motivate them to take an interest in their own learning. Is that not what we as educators aspire to?
Fun after the outcomes have been achieved	Now, you really don't get the concept of this do you?	Though one does not want to go down the road of edutainment, neither do you want to make it purely educational. If you want to go down that route use Flash
Motivating	Well that does depend on the game	Yes it does.

Table 6.2: Details of focus group discussion from Educators

6.2.3 Findings and Discussion of Focus Group

Educators on the whole wanted fun after the learning outcomes had been achieved and did not like the idea of a student failing in the game and were concerned with feedback and assessment as well as the game being focused and timely.

Whereas students felt that the whole point of the game environment was that you could fail. They also showed concern on the fact that a game would just have educational content and that it would be more a teaching aid rather than a game. They placed importance on fun, good character interaction, good storyline and appropriate challenges as well as believability, (verisimilitude), meaning that it is fine to have a dragon in a medieval world but a tank would be out of place. On this, the educators felt it was more important to have facts rather than fantasy.

Educators placed little importance on the storyline. They felt the interactions of NPCs should be in the form of teacher guidance or one that acts as a mentor.

Both sides agreed that the game had to be motivating; educators just wanted to feel that students were motivated but students felt that this really was dependent on the type of game. Motivation was explored in Chapter 3 and the difference between motivational aspects for playing a game to studying a topic is further explored in Phase 2a survey of Chapter 7.

The challenge part was a good discussion point where educators felt that it must not be too challenging, whereas students felt that it should not be too simple but needed to be fair. They felt that current educational games they had come across were not challenging enough.

The main perspectives of the two groups are highlighted in Table 6.3.

Educators' point of view	Students' point of view
• Fun after the learning outcome had been achieved • Relevant to curriculum • Focused and timely • Has aims and objectives • Use of educational pedagogy/relevant learning theories • Simple and easy to use • Feedback • Differentiation • Puzzles • Adaptable • Assess learning • Motivating	• Fun • Motivating • Some tangential/Informal learning • Open world or different levels to explore • Good storyline, characters, graphics and good game mechanics • Believable • Challenging • Feedback • Interaction • Immersive o Believable world o Characters that don't just stand there o Flow of game

Table 6.3: Perspective from both sides

From this, it appeared that educators still thought of educational games as just a tool, an extension of a quiz type game with virtual environment and were unaware of their full potential. Gamer/Students thought of educational games as a teaching aid and far removed from games they played and that the flow of the game would be interrupted with content that was not really relevant to the game and the focused and timely requirements of the educators would mean that they would not be able to wander in an open world.

6.3 Towards a conceptual framework: A game of two halves

The discussions with the two groups made it clear that in order to satisfy the needs and requirements of both sides, a new approach would be required.

In order to achieve an educational game that is in Marsh's range1 of his continuum *("Video games with fun & challenging gameplay for purpose"*) as mentioned in section 2.5.2, but also fulfil the needs of both parties, "a game of 2 halves" is proposed.

This conceptual framework needs to take into account what Student gamers expect in a game (fun and challenging game play) and what Educators expect (Game for purpose).

This framework integrates both needs by incorporating two different games in the same game; a Main World for what Student gamers would expect and Network Academy which will be more focused and timely for Educators. One influenced heavily by game design principles and student gamers and the other designed by what educators wanted.

The Network Academy thus will be incorporated into the Main World but is not dependent on it, and can be used as a stand-alone game. The Main World however is dependent on the Network Academy and the students who have completed tasks in class are rewarded in the Main World, which aids their progression. These tasks could be considered as "grind achievements". Grind achievements are used in games to either do repetitive tasks or tasks that don't necessarily advance you in a quest but that you need to do, either to get your skill level up or to enable to obtain money/gold, items that aid you in the main quests. Sometimes these can be designed as side quests, a good example of this is in the game Mass Effects (Bioware, 2007), where you have to go to different planets in order to progress your skill or obtain minerals, either through tedious scanning of the planets and then going down to find them and often fighting for them. Some of these side quests do not help with story progression of the main game but enable you to pick up skills, items, money or boost your skills, which can then be used in the main game.

The initial aim was to develop a framework in which there would be two games in one. The main game and within it a learning tool type of game. The learning

tool could be used in class but also act as grind achievements to those playing the main game. This changes the way that educational games are usually developed; either too edutainment or a learning tool with game elements hooked on (Klopfer et al, 2009). By having a game in the true sense and then including the pure learning aspects as added grind achievements, it would satisfy both parties' criteria. The main world would still have elements of educational content intrinsically woven (Habgood et al, 2005b) and the learning tool aspect would be more focused on educational content. This incorporates aspect of blended learning and flips the classroom.

In order to achieve this, we had to give both sides what they wanted within the same framework. But as in all relationships there has to be some give and take from both sides; not too much, just enough to make it work. "Motivational design is concerned with how to make instruction appealing without becoming purely entertaining" (Keller, 2006).

6.3.1 The Main World

The Main World: This area is for the gamers. (Portnow, Floyd 2008) "games first and foremost need to be fun". Though it will contain some elements pertaining to the subject within world and quests, the main learning is derived from tangential and indirect learning; the aim being to spark the gamer's interest but also have fun. Here students can fail, explore in their own time and have some fun in the process. This is shown in figure 6.2

The Main World is depicted as having different areas and villages and towns; the towns/villages could be located in different regions and the player could travel to any area. The player would have access to the Network Academy World; this could be either because of a specific quest that had to be completed or as part of a grind achievement.

The Main World framework is depicted in Figure 6.2 and the design considerations are broken further in Table 6.4

Main World Environment:

This part is the internal environment and the areas that were considered. These areas could be easily adjusted and new areas included within the Main World. These consist of regions, towns and villages within the main world. The areas considered are:

Fisherman's Wharf and **Ryan's Village** were amongst the settlements considered in the very first prototype (others were later added). Here you can talk to NPC and explore the areas, buy a house, stay at an Inn etc.
The **Cold Region** and the **Great Forest** are regions to be explored and could contain different elements including quests. The Cold region as its name suggests is a cold region and its environment is snowy, the Great Forest region includes a variety of trees, flora and fauna.
Worcester, was an area accessed through one of the quests in prototype2, this was the Earth World.
This Main World was set in Weogorna Civitas as discussed in Chapter 8.
The Network Academy is also an area that can be accessed from the Main World.

Main World Design Considerations:

The factors that seemed important from the initial discussions were incorporated as design factors to be considered. These were:

The game had to have **Good Playability and Interaction** with **Good Graphics** Include **Different Areas and Characters.** If it was to be an RPG, it had to have an **Open World** for the player to explore. It has to have a **Good Story**, with **Different levels**, and be **Challenging and** appropriate to the **Skills** of the player. It needs to include **different types of Challenges**. The Quests would require **Goals and Achievements** with appropriate **Rewards and Punishments.** To be an Educational game, it should support **Tangential Learning**

Analysis of Main World design consideration

Chapter 4, section 8 considered why players play and came up with the following:

Fairness is important to a gamer. The challenges need to be matched with the skills. The rewards need to match the level and complexity of the quest or tasks undertaken and the punishments need to feel fair. **Flow** is the balance between skill and challenge that enables one to be in the zone.

The feeling of Autonomy is achieved by giving the player some form of **Control, Choice and Empowerment.**

Interactivity is the action with the world; feedback and player acknowledgement would be the outcome of that interactivity. Players expect some form of action and reaction from a game. **Feedback** helps us know that we are going in the right direction, gives us clues to the action, and encourages us to proceed. Feedback of interaction with world objects and NPC is also important in **Player Acknowledgement.** A believable environment and interactivity gives the essence of **Verisimilitude.**

Fun: What makes us decide if the game is good or not is the experience we get from the game. This includes aspects of all the above as well as Sylvester's (2013) emotional triggers that was discussed in Chapter 4, Section 5.1.

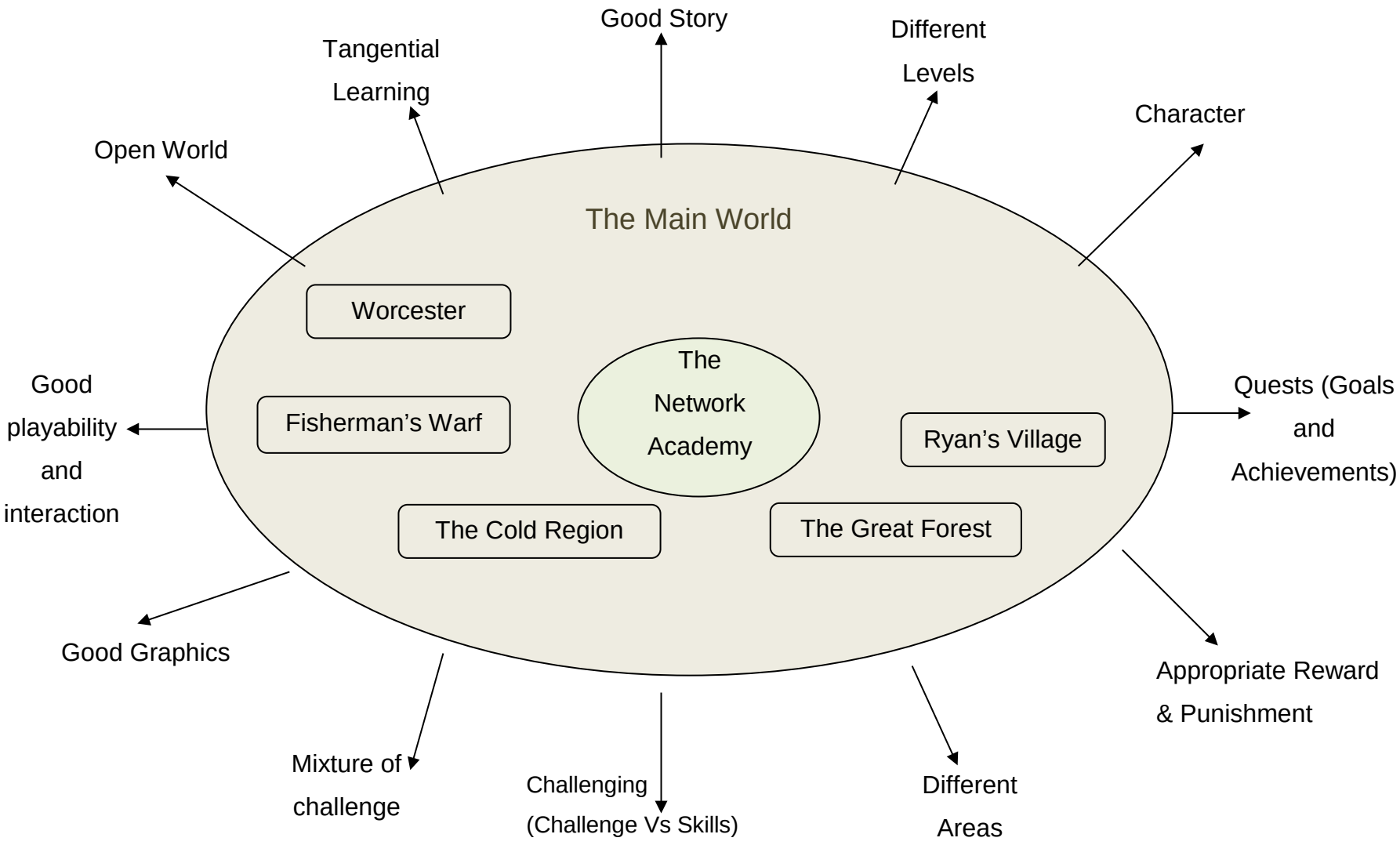


Fig. 6.2: Game Based Educational RPG Framework: Main World

S1	**Good Playability**	Good playability encompasses many things including those mentioned below as well as controls of the game. Also includes aesthetics of does it feel right, does it look right from Chapter 4, section 5.
S2	**Interaction**	Interaction includes good mechanics as well as actual interaction and feedback from the world
S3	**Good Graphics**	Chapter 4, section 4.5.2 (graphics do matter), but not as important and does depend on style of game
S4	**Good Story**	Chapter4, section 6.1. Though games exit without narratives, it helps the story along in an RPG. It can also work as feedback and help give relevance to the quests and tasks
S5	**Open World**	A good RPG allows the player to explore and discover an open world that is diverse.
S6	**Different levels**	Motivation would decrease when the activity or situation either no longer presents new possibilities or lacks variation. Chapter 3, Section 2.1 (White, 1959). Here levels could also be different player levels rather than different areas
S7	**Different Areas and Characters**	Same as above and adds to exploration, curiosity, fantasy, socialisation etc. Also important for emotional triggers, where Sylvester (2013) talks about sameness. (Chapter 4.5.1)
S8	**Types of Challenges**	Same as above, but also need to give them a choice of types of challenges
S9	**Challenging**	Challenging enough to balance with their skill to maintain the flow of the game; Csikszentmihalyi's Flow. (Challenge Vs Skills)
S10	**Goals and Achievements**	Players like to understand what their goal is and feel they have achieved. This does not necessarily mean they have a reward for an achievement; that their action that has been acknowledged is equally important.
S11	**Rewards and Punishments**	The rewards match the skill required and the complexity of the tasks. That the rewards and punishments feel justified to player
S12	**Tangential Learning**	Some will seek out extra information in order to find out more. Here use of books/facts in game can be given as a choice, to spark their curiosity.

Table 6.4: Main World Design Consideration

6.3.2 The Network Academy

The Network Academy:

Though not eventually developed as a distinct area in the current prototype; an element of an Academy was incorporated within the main World for testing.

This would be a separate area where the quests would be focused, timely and relevant to the topic in hand. This area will be like a virtual academy the gamer has to visit in allocated class sessions. Here the use of blended learning incorporating the game could be part of the whole experience. This could be anything from reading a piece of text, off-line discussions or some form of active learning. This is shown in figure 6.3

The Academy world's environment would be associated mainly with elements of education and include areas such as dormitories, blocks that could represent different faculty areas, a board for different subjects/topic quests from which the player can choose. A quest area for the initial or subsequent quests that need to be completed, this could be anything from a simple building to a more complex area such as a type of village area within the Academy. A future portal could also be included; this would enable the player to travel out of the medieval or whatever era the game would be set in. This seemed appropriate as the designed game was set with a medieval theme; travelling to a different era would keep the believability of the game, if the game required objects or scenes that would not fit within this world.

There would be access to the Main World from the Network Academy World, though it should also be possible to limit access. Depending on educational requirements and needs of the Educators, the Main World could be excluded during class time; this could be achieved by having two styles of starting/continuing a game; one that limited you to just the Academy and one that did not.

The Network Academy is incorporated into the Main World but is not dependent on it and can be used as a stand-alone game. The Main World however is

dependent on the Network Academy and the student who has completed tasks in it, is rewarded in the Main World, which in turn aids their game progression.

The Main World framework is depicted in Figure 6.3 and the design considerations are broken further in Table 6.5

Network Academy World Environment:

The environment and areas that considered could be easily adjusted and new areas included within the Network Academy. The areas that were considered are:

The **Dormitory** is where players can sleep, eat and rest as well as read from the library and meet with other student NPC.
Educators' Guild is where the player can find help and talk to the Educator Factions; this is equivalent to the Mages guild found in the original game.
The **Quest Area** could be a place specifically outside the Academy that can be accessed from a quest or within the Academy World; tasks and challenges would be set here.
The **Subject Board** is really a subject/topic board for players to choose different quests.
The **Alchemy Block** is where skills can be practiced to learn a bit more about Science. Different blocks could be added, for different subject areas.
Future Portal is a portal that could go to a different world from the medieval world to show different types of worlds set in the future.

The **Main World** is also accessible from the Network Academy. This Area could be completely closed off from the Main World if required; useful for those Educators who want to keep the Students focused in just this area.

Network Academy World Design Considerations:

The factors initially considered for the design elements for the Network Academy game were:

The game or quests had to be **Achievable** and the design needs to consider how to incorporate some form of **Blended Learning.**
The game should have the ability to **Input Material** and **Assess Learning** and incorporate **Good Educational Pedagogy.**
Educators wanted the game to **be Relevant to the Curriculum** and also for it to be **Timely and Focused.** Having an area such as the Network Academy can accommodate this.
It needed to have a **Mixture of Challenges** and include **Differentiation**
Clear Aims and Objectives were an important factor. It also needed to include good **Feedback** with **extra Guidance** if this was needed.

The Network Academy will be more focused and timely and could follow more traditional instructional design paradigms or maintain the game feel but the content will be clearly framed for educational purpose. Table 6.5 shows the design considerations

Educational Pedagogy in Game Based Learning was covered briefly in Chapter 2, Section 5.3. More in depth discussion of the elements of Pedagogy and Games were explored in Chapter 3, Section 7. The mapping of RPG to learning theories was dealt with in depth in Chapter 4, Section 9.

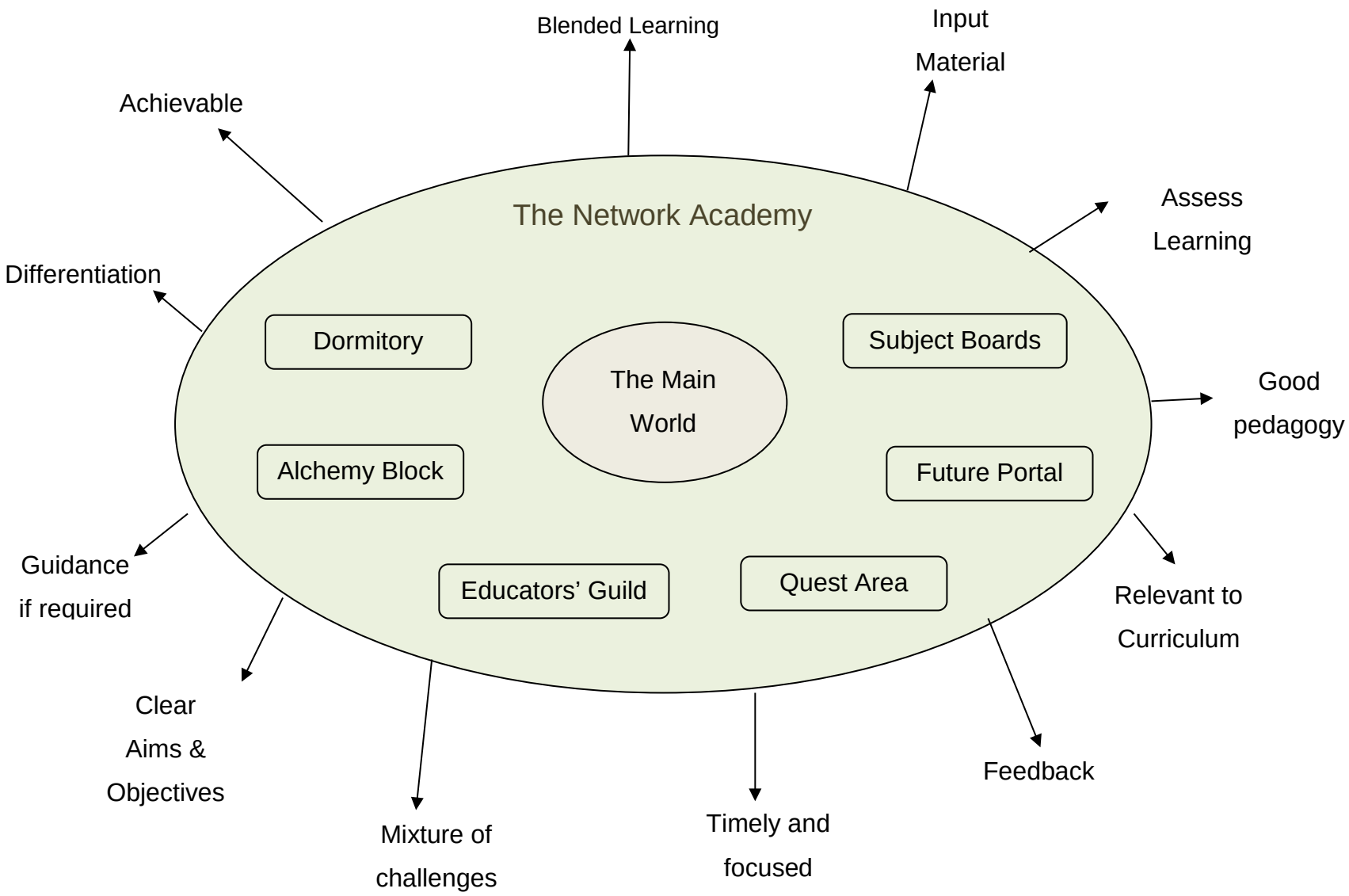


Fig. 6.3: Game Based Educational RPG Framework: Network Academy

E1	**Achievable**	If the game is designed according to the skills and player level then it should be achievable but not too simple
E2	**Clear Aims and Objectives**	Most good games have this. The difference for the Academy area would be that the content, aims and objectives would be framed more
E3	**Mixture of Challenges**	This is important (see S6, S7 and S8) Table 6.4
E4	**Differentiation**	Same as above
E5	**Blended Learning**	This fits in with a good educational game as does tangential learning from S12
E6	Ability to **Input Material**	Some games can do this, however only from the player. Input of material from an Educator requires expertise; this would depend on the type of game engine used.
E7	**Assess Learning**	All games can do this. However actual assessment of educational content and grading within the game could lose the essence of a game
E8	**Good Educational Pedagogy**	As discussed in Chapter 3, section 7.
E9	**Relevant to the Curriculum**	Can be achieved, though care has to be taken to ensure that gameplay is not lost in Main World
E10	**Timely and Focused**	Only in the Academy, the rest of the world is open
E11	Good **Feedback**	Games have feedback, see Chapter 4
E12	**Extra Guidance**	Caution on this as research has shown that students have found educational games not challenging enough. It is important to balance challenge against skill level.

Table 6.5: Network Academy Design Considerations

6.3.3 Differences and Similarities of the game of two halves

The pictorial representations, showing the Academy and Main World in figures 6.3 and 6.4, include the vision of what the first prototype would contain.

The internal depictions of the world environments seen in the frameworks represent the actual worlds themselves. These can be designed in different ways and include different elements, depending on the audience; the Main World would have areas more favourable to gamers, whereas the Network Academy would be more conducive to areas more favourable to educational needs.

The considerations for the design elements depicted were taken from the initial discussions. Just as the environments for each side would require different consideration, the design of these spaces would also need to be treated differently; the Main World design informed by Game Design Principles and the Network Academy by Educational Pedagogy.

What is paramount in the final design is that the Main World should follow the aspects of Game Design Principles discussed in Chapter 4 and its design and development should be influenced by these.

If one considers the elements of Autonomy, Competence and Relatedness from Deci and Ryan's and that of Malone and Lepper's intrinsic motivational factors of Challenge, Curiosity, Control and Fantasy mentioned in Chapter 3, section 2 and map these to the initial requirements and findings, one can see a correlation to the Student gamers' Main World design considerations. It was stated in Chapter 4, section 8, that though not a definitive list, players play for one or some of the following:

- To be challenged
- To Socialize
- To Explore
- To Feel in Control
- Out of Curiosity

Because we came to the conclusion that play is voluntary and that it has to be worthwhile for them to participate in (relevance, which is also one of the mainstay of good pedagogy, especially in relation to Keller's ARCS).

The Challenges have to actually challenge them (in order for them to feel a sense of Competency) and that they also need to have some sense of control (some form of autonomy).

In order to clarify the differences and similarities between the two, the design elements were mapped.

Design considerations from the Educators' from table 6.4, was mapped to the Students' design considerations of table 6.5. These similarities and differences between the two styles of requirements are shown in Tables 6.6, 6.7 and 6.8. Table 6.9 gives an overview of both Educators and Students.

Legend	Explanation
	These elements correspond and can be found in both, see table 6.6
	These elements correspond but require either adjustment or special consideration, table 6.7
	These elements are not found in Students' requirements, table 6.8
	The elements S3 and S4 were not considered important from the Educators' point of view and are not mapped

It is clear from both requirements, that the Educators placed little importance on Story and Graphics; as the mapping was considered from the needs of Educators in relation to Serious Games; these therefore could not be mapped.

E1 mapped to S1, S7 & S9	A well designed game has to be achievable in order to be considered to have good playability, which also includes matching the challenges to the player's skills
E2 mapped to S1 & S10	Aims and Objectives ensure that a game has good playability and these can also be shown through goals and achievements
E3 mapped to S7 & S8	Good games should include a mixture of challenges. Added areas and NPC characters can ensure different types of challenges. Players would get bored of same types of challenges.
E4 mapped to S6, S7, S8 & S9	Differentiation in a game is not only about different types of gameplay, interaction, challenges and places to visit but can also include different levels of play from easy to harder
E11 mapped to S1, S2 & S10	Feedback is found in many forms in a game. It is important for players to feel acknowledged by the game in some form and give feedback to actions taken

Table 6.6: Design Elements found in both

Some elements clearly correlated to both and these elements were considered in discussed in Chapter 3, section 7 and Chapter 4, section 9, in relation to Educational Serious Games. The above table shows some of these. Table 6.5 shows more corresponding elements, these however require some adjustments or consideration to be mapped to the Students requirements and Table 6.6 shows the one design element that Educators felt was important (Timely and Focused) but it contradicted the views of Student gamers who felt that an Open World was paramount in an RPG.

E5 mapped to S12	Though players would prefer Tangential Learning, an Educational Serious Game could also include Blended Learning
E6 mapped to S6 & S10	It is possible for player to add notes into the game with an additional modification. It is also possible to add new levels to the game (though requires expertise). This would be dependent on type of engine used
E7 mapped to S10 & S11	Assessing the player can be done through the achievements and rewards
E8 mapped to S1	Though Pedagogy is important to Educators and Playability due to good design is important to Students; they are both important in an SG
E9 mapped to S6 & S8	Either one or two levels or different areas could be have content that is relevant to the curriculum. In this the Network Academy Area would hold all relevant content, whilst the Main World would have some relevant content
E10 mapped to S6, S7 & S8	The Main World is Open World and would not be as Timely and Focused, the Academy would be more suited to this. Different challenges could also be timely and focused; however it would be wise to make all the Main World limited to time or too focused as the aim in an Open World is to explore and discover
E12 mapped to S6 & S9	Extra Guidance could be dependent on the type of challenge and skill level. Certain areas or at the beginning of a new skill/task; more guidance could be offered depending on the game. There would normally be easier challenges and more guidance could be given on those on easier levels. However it is important to ensure balance of challenge VS skill

Table 6.7: Elements requiring consideration

Legend	
E10 mapped to S5	The Main World should not be constrained in an RPG; it should allow the discovery and feel of exploration

Table 6.8: Elements that do not match up

	S1 Playability	**S2** Interaction	**S3** Graphics	**S4** Story	**S5** Open World	**S6** Levels	**S7** Types of Challenges	**S8** Areas & NPC	**S9** Challenges VS Skills	**S10** Goals & Achievement	**S11** Rewards & Punishment	**S12** Tangential Learning
E1 Achievable												
E2 Aims and Objectives												
E3 Mixture of Challenges												
E4 Differentiation												
E5 Blended Learning												
E6 Input Material												
E7 Assess Learning												
E8 Pedagogy												
E9 Relevant to Curriculum												
E10 Timely & Focused												
E11 Feedback												
E12 Extra Guidance												

Table 6.9: Mapping the Design requirements

6.4 Towards a suitable game engine

Once the genre and a preliminary framework had been decided on, it was then a matter of finding the right development tool to facilitate the design and development. During the space of six months, many game engines and tools were looked at ranging from, Torque (2010), Unity (2010) through to UDK (2010). I also looked at editors that came with certain triple A games, such as the CryEngine (2010) and Valve engine (2010) as well as the Oblivion engine (2010) from Bethesda Games Studio that was used to develop the initial small prototype. I discounted the Torque engine as it required a high learning curve and at the time, the company was looking for new buyers; which could have been a risky choice. Though I was impressed with both Unity and UDK and had colleagues who used UDK, I felt that it would be great for FPS style games or Simulation (in fact our department had used it successfully for Simulations), but it seemed unsuitable for one person to develop an RPG game with it.

It was important to find an engine that could facilitate some form of modification of an existing game to aid with the design and development. This would mean that I would not have to be concerned with finding or making all the assets for the game.

As well as the affordance of the engine, there is a difference of designing and developing an RPG to other types of worlds. For instance for FPS on the whole work with levels and each level normally has to be completed before the next map is open to players. In some instances, as in Mass Effects (Bioware, 2007), that is considered an RPG, though many would consider it a hybrid of FPS and RPG as it has elements from both; the world is set up so that you can travel to certain areas but it does not have the feel of a true RPG as the NPC's do not interact with you once you have completed certain parts, and the most annoying thing is often they just stand there.

The one thing that Bethesda has managed to accomplish is a form of a living world, which is what their RPG games are well known for.

6.4.1 Modding

Many existing games come with toolsets that allow modification of game environments; this could be from adding new quests to simply adding new characters or elements in an existing game. The advantages of using an existing game as a foundation was that many of the required assets were available for use in the new game and new models could easily be added. However in this instance though the assets and characters could be used and modified, a new world had to be built in order to by-pass the original game; in order to ensure that students would not be distracted with the original game. This meant all the environment, locations and quests had to be designed and developed; thus making it a partial conversion but easier than a total conversion. A total conversion of a game is when all the original game assets and world is replaced and a completely new game is developed using the engine.

Though Oblivion is considered an action fantasy RPG, that has a from of living world that was made possible by their Radiant AI system, the Oblivion modding community have improved the feel of immersion in many ways; from simple crafting to vast total conversion of the game.

Many of the elements featured in the modding community have appeared in the new Skyrim (Bethesda, 2011); modding not only allows the community to indirectly be listened to and inspire the game companies to add elements that fans are generally unhappy about but it also lengthens the life of the game.

The modding of commercial games for educational purposes is not a new concept; the most well-known is possibly Sid Meier's Civilization which was first released in 1991. Oblivion too has been modded for educational purposes. The Eduventure-II project was designed in Oblivion by Wechselberger (2009) to show an approach to educational design; the conclusion was that the engine was too complex for such a venture and not ideal for this purpose. However since then, Fassbender successfully used Oblivion to create a virtual world for a history lesson as well as to test the effect of music on memory (Fassbender et al, 2012). Shute et al (2009) used the game to test and obtain evidence about current and emergent cognitive and non-cognitive attributes through evidence centred design (ECD) (Shute et al, 2009).

One advantage that modding has is that is easier than starting from scratch especially if you want to emulate the commercial type games as near as possible. There are however, disadvantages and it is still a high learning curve especially if you are a team of one.
You do not get access to all the code, which means creative scripting to get the game to do what you want, you have to learn to manipulate many third party tools and integrate all the components. You have to take on the role of programmer, level creator and graphic designer all rolled into one.
Having decided on a modding tool I looked at all the games that facilitated this which included Dragon Age (EA Games), Neverwinter Nights (Obsidian Entertainment) and the Oblivion (Bethesda Game Studios) game.

I eventually settled on Bethesda's Oblivion engine, the little experience I had with it swung my decision, at least I would not have to start from scratch and there was a vast community that could be accessed if required and the modders had built extra tools that would make my life easier. However, it was not the only reason I chose this engine; one reason being was that I was a fan of the game and the possibilities that this medium could be transformed for educational purposes was an exciting concept and the other, was its almost emergent capability in its propriety Radiant AI.

6.4.2 The Elder Scrolls IV: Oblivion

The Elder Scrolls Oblivion IV: Oblivion was developed by Bethesda Game Studios in 2006 and is action fantasy Role Playing Game and is the fourth in the Elder Scrolls series. At the time, it was considered to break the mould for this genre with their vast expanse of worlds, the interactivity of the NPCs bringing the world to life, the actors used for voice dialogues that included such actors as Patrick Stewart, Sean Bean, Lynda Carter to name a few and the soulful and sometimes rousing music of Jeremy Soule.
In the international journal of computer game research, Paul Martin (2011) reviews the landscape of Oblivion in his "The Pastoral and the Sublime in Elder Scrolls IV: Oblivion" where he refers to the landscape as sublime, lending the game an epic grandeur and migrating to picturesque as the player becomes

accustomed to the vastness of the landscape and more familiar. Considering the game was developed in 2006, and other games have come and gone, it still resonates as an impressive game in the genre of RPG. The new Elder Scrolls V: Skyrim is even more breath-taking in its vista then the 2006 game, though Bethesda kept the feeling of the Elder Scrolls style and it was released in November 2011. (A point that when I was modding and researching a lot of gamers asked why I did not mod in Skyrim, it had not come out when I started and I was familiar with the Oblivion engine). Of course graphics capability and hardware and engines have advanced since 2006. At the time Oblivion required 3 Ghz Intel Pentium 4 or equivalent processor, 1 GB System RAM and ATI X800 series, NVIDIA GeForce 6800 series, or higher video card.
It was considered graphic intensive and a lot of the systems at the time could not handle the game and tweaks had to be made in order to run the game.
A guide was released in 2006 (Ghazi, 2012) and is updated regularly for gamers who need to tweak their system in order to play the games, though it was originally for Oblivion it is used to optimize any game experience. At the time many had to tweak aspects such as the details on the distance of objects and lands, slighting aspects such as Bloom or High Dynamic Range (HDR), shadows on or off, reflections, anti-aliasing and numerous tweaks that could improve performance but often at the expense of the aesthetics or gameplay.

But it isn't just about the graphics, some gamers consider Oblivion graphics not as up to date as the games that have since come out; in comparison to its follow up Skyrim, Oblivion does look dated but a game is not just about the graphics alone, it is so much more. One is reminded, of Juul's *"rules of irrelevance"* where he states that some games that players play will not lose their appeal (Juul, 2011) and Whitton (2012), too believes that players would forgive a less than perfect environment (Whitton, 2012); players overlook the quality of aesthetics if the game has been designed well and includes good gameplay.

6.4.3 The Oblivion Engine

Bethesda's Oblivion game uses the Middleware Gamebryo engine, modified to meet their requirements. I was fortunate enough to have an evaluation copy of the original Gamebryo for six months. I found it interesting and daunting at the same time and it gave me an insight into the world of middleware and games development engine, but I was relieved that Bethesda had modified it for their RPG and that I would not need to grapple with its complexity and nuances. The Oblivion game also used Havok as its physics engine and SpeedTree technology, the game editor also included the ability to lip synch the NPC dialogues and has a quest system. It also enables the player to choose between first-person or third-person camera angle.
But the one aspect that most influenced my decision to use the Oblivion engine was the Radiant A.I that was developed by Bethesda. This A.I. system provides NPCs with procedural generated scripts to complete their tasks and means that the NPCs are not restricted to hard scripted activities or objects. The AI system is also closely linked to the scripting and quest systems (Stein as cited by Zielke et al, 2009).

Some gamers who voiced their opinion on the forums (Nexmods Forum, 2014) felt that the new game (Skyrim) though brilliant in many aspects lacked the depth of dynamic interactivity of that of Oblivion. It is a view of some that it was simplified as some NPC had erratic behaviour in order to fulfill their AI packages, in the Oblivion game. Though more complex routines were used for Skyrim, some gamers on the forums felt it wasn't as dynamic living world as Oblivion and I tend to agree with them.

Gavin Carter, a lead producer for Bethesda, in an interview in 2007 for gamestorylife.com, a game review site (republished by Voudoun in 2014), stated that the most challenging element was the RAI. They had to deal with NPCs killing each other and especially essential plot characters, breaking the economy by buying up everything. He felt that giving over a 1000 NPC some form of autonomy was a dangerous proposition. According to Emil Pagliarulo (a designer for the game) stated that the developers had to tone down the AI for

the actual release of the game because of the NPCs unexpected behaviour in some instances (Bitmob, 2010).

This was something I found in my own development phase, for instance giving an eat package, I had to ensure that the NPC had an unlimited amount of food so that they would not behave erratically, by stealing or killing others.

Some of the unexpected behaviour I had included killer small cats, where I had used a modified add on from the community, but it still had the mountain lion AI still attached to the creature. When I returned I was shocked to see that one of the NPC was dead, I soon discovered that the three cats that seemed so cute had the killer instincts of a mountain lion.

I had also in the early days ensure that one of the NPC representing a mentor could not be killed by mistake, of course this meant that you ended up being killed, especially as one of my testers kept using the fight mechanic in error.

In one of the initial prototypes in the land of Duddan Leah (Old English for Dudley), my Dudley guards were joined by Imperial ones from the game. I had given the Imperial test guards the AI to go to my guard house and then changed them to Dudley Guards but forgot to delete my test Imperial guards who came into the guard house. These Imperial guards just left after a while, albeit a bit confused on their next AI package, which took them to the world of the original game, which of course they could not access.

And as Aarseth, after playing Oblivion, commented on the unexpected things that players do or that games inadvertently allows them to do, as *"These moments of game transgression are nevertheless highly important to players, and in many cases celebrated as important events, or vilified as problematic and destructive…are not incidental to gaming, but a vital part of the player experience"* (Aarseth, 2007).

6.4.4 The Oblivion Editor: TES Construction Set

One of the important factors in considering an RPG editor was the ease of adaptability for the developer, extensions that were available through the Oblivion modding community and the affordances that the genre and editor could give to achieve a good sound educational game. Bethesda's The Elder

Scrolls Construction Set known as TES Construction Set or TES CS was the same tool used to create the game worlds for the original game and allows full control of the game's content, though certain elements that are hard coded cannot be touched. The editor enables you to either modify the existing game or convert the whole game through Plugins.

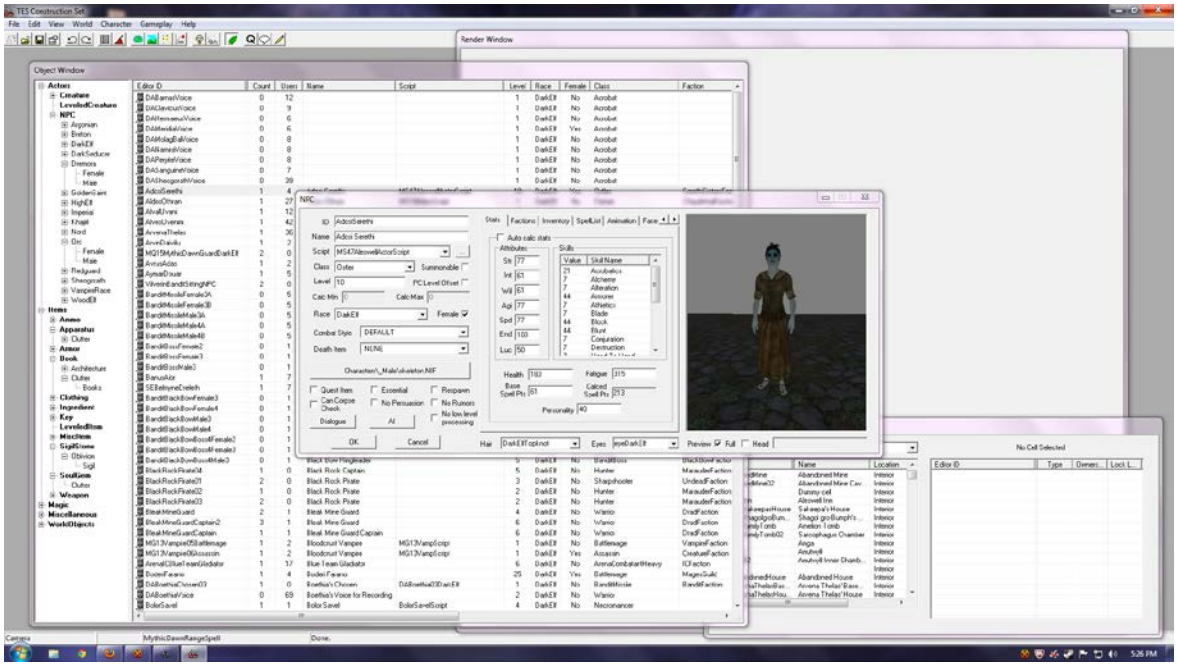


Fig. 6.4: Oblivion TES CS

Fassbender (2012) created a virtual history mod on the Macquarie Lighthouse, he found the dialogue system together with lip synch allowed him the flexibility he needed for his world, he also felt that the ability to use first-person viewpoint enhanced his world and he was able to add additional content of his Lighthouse that he had designed in 3DS Max. He also commented that the ability to use the point and click of the construction set without requiring any programming skills enable him to achieve the functionality he needed. Unfortunately, I will require more than the point and click facility provided by the editor and will most likely need to go beyond the present scripting capability; fortunately the modding community have developed tools to aid in such a venture.

Use of third party software can enable you to manage, convert to master file, add extra scripting capabilities or even use an optimised editor based on the original; most of these have been developed by the modding community. The

whole content, including the original scripts, dialogues, assets and quests are made available, however new assets can only be done through third party software.

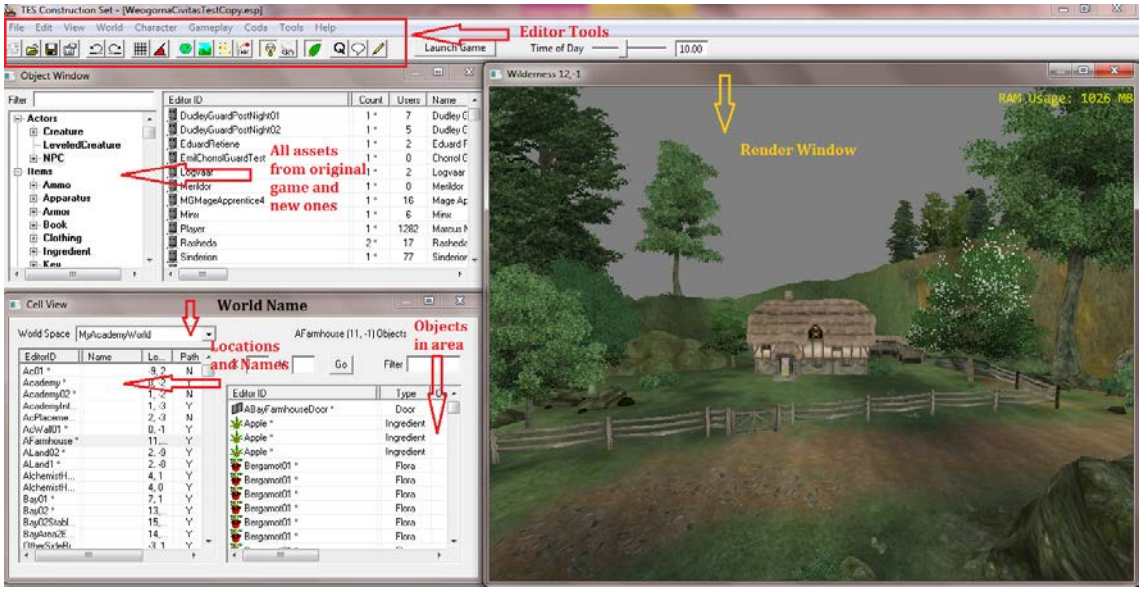


Fig. 6.5: Oblivion Editor (Extended version)

6.4.5 RPG affordance found in the Oblivion Editor

One of the important factors in considering an RPG editor was the ease of adaptability for the developer, extensions that were available through the Oblivion modding community and the affordances that the genre and editor could give to achieve a good sound educational game. The following are some of the considerations taken into account for the choice of editor.

Character Design

The editor enables you to add your own characters or alter the characters present in the existing game or make new races. The Player is able to change their appearance, their clothes, their race and their gender. This ability gives the player a sense of ownership of the player which is an important in enabling empathy with their character.

Books and Journals

Books can be easily altered with html to add images and required texts that will aid the student. These can be used for specific or general information. There is also ability for the student to write in their own books/journals.

Dialogues

A player communicates with an NPC through text based dialogue. The NPC can either respond in text based or audio dialogue. Where possible audio by the NPC will be used as this gives more depth to the environment.

Cut Scenes

Cut scenes are used to forward the storyline. These are video cut scenes of the player and interactions he/she makes.

Interaction

The player has the ability to sit and sleep as well as the normal interactions of taking and dropping items and interact with NPC. NPCs themselves can interact with other NPCs and objects within the game as well as the normal interaction with the Player. This means that NPCs can sleep, eat and talk to each other.

Artificial Intelligence

AI gives the ability to enable different states to occur depending on conditions. This means that the NPC can be given a full schedule of activities that can be done each day and can abandon normal schedules for special conditions. For example, an NPC can go to bed, read, eat/drink, rake the field at certain times and also be at certain locations for required quests and even asked to follow the player through certain quests. This gives the player a certain feel of immersion if the NPCs are not just standing around (Schell, 2008; Kremers, 2009). As previously stated Bethesda's propriety, Radiant AI that was integrated with scripting and quest system was one of the reasons for my choice.

Weather and sky

The ability to have different types of weather from snow, fog, rain through to clear sunny days gives the world an added feel of immersion. The weather can

be set to changeable and different locations can have different weather patterns.

Open World

This is one of the main differences between this genre and other types of games. The world is open which does mean that you can explore at your own leisure and revisit areas. Not only can you have different types of locations, different worlds can also be incorporated. Weogorna has a fantasy world and the ability to travel to medieval earth and visit Worcester Cathedral.

Trade and Shops

Though a player can find and receive rewards on completion of quests, shops and traders are another way of obtaining items. The player's inventory is limited and selling unwanted goods gives the player money they can use for required items for themselves or a quest.

Inns and Abodes

The ability for the developer to make certain dwellings an inn or for sale is an added incentive for the player. Inns are usually found in towns and cities for the player to interact with other NPCs and to rest. Abodes for sale are usually available after certain quests have been completed, with further charge for furnishing the house. The better the house the more money it costs the more quests you are motivated to complete to earn the money.

Factions and guilds

Factions and Guilds are commonplace in RPG. The developer can add many different types of factions. For instance, you could have a teacher faction or student faction or simply an area faction that NPCs belong to. The player's conduct in the quests and with individuals and their own faction affiliation will make a difference in how an NPC responds to them. This facilitates positive and negative reinforcement of joining different factions.

The developer can also add new guilds and associate guild quests; this means for instance, a Science Guild can be joined and on progression through various

quests, the player advances to become an expert. This again adds to the sense of immersion and gives motivation to the player to complete the tasks set.

Quests

This is one of the strengths of using this type of genres. At each stage of a quest, a journal is updated and the player informed of the main status. Quests can be simple or complex; from finding an object, retrieving and returning the object to its owner to more complex ones where one has to solve problems, puzzles, negotiate through dungeons or traps and fight one's way to achieve the ultimate goal (Howard, 2008). Quests in the world can therefore be developed as lesson objectives.

6.4.6 Additional requirements to the Game Editor

One of the biggest advantages of the TESCS is the ability to create new data and stories which are stored as plugin files. This means that not only can you add new quests to the existing game but you can also by-pass it and make a whole new world and a game that is not dependent on the main game; though it still requires the player to have the original game in order to play the mod.

All the original game's scripts and quests are available to view which was invaluable both as a learning tool and further inspiration.

The modding community and the TESCS wiki were invaluable tools and inspiration for the design and development process, they were also useful for ensuring I had the additional tools required to continue my quest.

One of the issues with using the Oblivion editor was that, though the editor was used for the original game to build the world and quest, you were limited in certain aspects such as the scripting and the editor itself, so certain tools had to be added.

One such example is, the Oblivion Script Extender (OBSE) which is a modder's resource developed by Patterson et al that expands the scripting capability.

Most of the mods that were needed to enhance my own mod such as the graphics and extra assets included OBSE, which was also another reason to add this utility; I had avoided making my development phase too complicated

but had to concede in the end, that without it I could not achieve my objective. The other reason for using it was that the original TESCS was rather buggy and kept crashing so the Construction Set Extender which was a plugin for OBSE was required. The Construction Set Extender by ShadeMe (Figure 6.5) added new tools as well as fixing various bugs in the original editor.
Various modder's resources were also incorporated into the final prototype to enhance the player's experience.

Though the editor and added utilities were sufficient to develop the new worlds, further programs were required in order to either change textures for the game or add new content such as animations or new models. The textures files used in Oblivion are DirectDraw Surface file format (dds) which meant that a converter was required for the graphic editing software, I used Photoshop for the textures and used the NVIDIA DDS plug-in which supports the DXTC texture compression format. Normal Maps were also required for the textures and these were done in Photoshop. For the modelling and animation 3D Studio Max was used and the NifTools plugin for 3DS Max to export the models as Net Immerse Files (nif), which the game uses.

6.5 Discussion

Educators, overall, are governed by educational pedagogy and instructional design paradigms. It is therefore not surprising that when faced with a new medium, they seek to bring in the knowledge of the pedagogy that they follow regardless of the medium; forgetting that this medium may require a different approach. Guided by perceptions, existing knowledge and subjected to the rigours and regulation of the educational system; the main aim is not to disrupt the equilibrium. For most the aim is to educate and that means proof that the student has learnt through the various tests that the system demands.

Phase 1: What do Educators and Students want from a Serious Games?

To educators an educational game is an epistemological issue and not one of ontology. It is not to say that existing educational pedagogy is not an important consideration in using this medium; it is paramount, but that a shift in perspective is required. There is a need to understand what a game is, but more importantly what games, student gamers actually play. Learning tools cannot be perceived as games, just as casual games such as Candy Crush or its equivalent; there is a need to recognise what gamers mean when they say they play games. They often mean 'complex games' as coined by Prensky (2005). A need to understand the concept of games in terms of the gamers first, before an attempt is made to utilise its potential.

We cannot just transfer our educational pedagogy or instructional design concepts into a game and hope it will do the trick. Neither should we dismiss this medium because it does not fit in with our understanding of what it means to educate.

"A game is a problem solving activity, approached with a playful attitude". And "Play is manipulation that indulges curiosity", (Schell, 2008) resonate with the aims of this thesis. Fun needs to be removed from the equation of designing as fun is a personal concept and fun to one is not the same as fun to all; fun for some may be competition for others parachuting. Though it has been removed from the consideration in the design phase, you will see the word that will still be used as it seems to be prevalent in the vocabulary of some of the research as well as some of the participants. The term fun was considered in Chapter 3 section 3.5.1 and revisited in Chapter 4, section 4.7.8.

Therefore, it is sufficient to think of designing a game that will include problem solving activities and steer away from just badges and points. Approaching it in a playful manner, may inspire play that indulges one's curiosity; the spark to ignite the interest of those disconnected with the topics.

There is no reason to believe that we cannot harness the potential that Game Based Learning can give us without disrupting the learning. As Barab states, there is no reason that we cannot "combine the framework of gaming, with the content and inquiry-based pedagogy of schools, reuniting the early childhood experience of learning and play" (Barab 2005).

Phase 1: What do Educators and Students want from a Serious Games?

There is an ongoing debate between instructional and game designers as to the way a Serious Game should be designed (de Freitas and Liarokapis, 2011), and the role of educational pedagogy and content. As previously mentioned, (Michael and Chen as cited in Marsh, 2011; de Freitas and Oliver, 2006, Whitton, 2012) amongst others believe that pedagogy needs to be central and its focus should be the primary goal; whereas others in the field argue that the story and entertainment component has to come first and that pedagogy must then follow (Zyda, 2005; Prensky, 2001). However consideration has to be given on what one is trying to achieve, a form of gamified game can put pedagogy first but will only be a learning tool, whereas a Serious Game has to consider game elements as a primary concern to follow the true essence of the original philosophy of what Serious Games are about.

This thesis therefore attempts to stay true to this and to design and develop a Serious Game that is both educational and a game in the true sense without compromising either aspect; *"Video games with fun & challenging gameplay for purpose"*, (Marsh, 2011). It therefore, follows the philosophy of Marsh's interpretation of what a Serious Game is as mentioned in section 2.5.2 and aims to encapsulate in its design and development, all the characteristics of games; entertainment games with a purpose. (Marsh, 2011)

6.6 Summary

Phase 1 of the study resulted in the formulation of a framework and the decision of the genre and game engine for the prototypes.

The initial focus group discussion between Educators and Students led to the realisation that both sides had requirements that needed to be included in order to meet their expectations.
It was clear that though there were similarities in some aspects but there were also main differences that could not be solved within one style or type of game.
The solution was a framework; a game of two halves. One that satisfies what Educators expect; a game for purpose, following instructional design and pedagogy to ensure the content is educationally framed. The other half would be designed to satisfy what Student gamers expect; a fun and challenging game play that encapsulates game design principles along with sound pedagogy.
The framework provided a suitable conduit for the use of RPG game genres and the use of the Oblivion engine to convert and modify an existing game seemed a natural choice for the task; due to the researcher's prior experience of the engine and its affordances.
The design and development of the resulting prototypes are discussed in Chapter 8.
The following Chapter 7 covers a wider survey in order to supplement the focus group discussion of Phase1 and aid the design and development processes.

"The teacher who is indeed wise does not bid you to enter the house of his wisdom but rather leads you to the threshold of your mind." (Khalil Gibran)

7 GAMES AND LEARNING: PERCEPTIONS OF EDUCATORS AND STUDENTS

This chapter covers the analysis and results for Phase 2b, the wider survey, mentioned in Chapter 5, Section 3. Phase 2a is covered in Chapter 8

In order to ascertain whether a suitable framework could be designed and developed, this survey followed the initial focus group and was conducted at the same time as the development of prototype1. The focus group helped to kick start the process, the survey was undertaken to supplement the views from the original focus group and aid further understanding from the initial research question, "What did students and educators want from a Serious Game?"

7.1 Wider Survey Rationale

A survey was carried out to supplement views and ascertain what educators and students thought should be in an educational game. The detailed analysis of the survey is included in Appendix1.

Details of the demographics along with the research methodology can be found in Chapter 5, section 5.4.

The survey was done using Survey Monkey. The participants were Student N=88 and Educators N=52. The aim of this was to gain an insight to the use if any of educational games in the classroom, the genre of games played and their motivational factors. Two different surveys were used, one that targeted

educators and one that targeted students. Some of the questions were the same for both types of participants where applicable.

7.1.1 Aim of the study

Though some of the details gathered were important to give an overview of demographics and subjects taught, the main aim of the survey was to ascertain the following.

- Motivational factors for learning and for playing a game

Other aspects were also deemed important such as

- Use of Video Games by Educators
- Design of an educational game
- Genres of games played

From these the main research questions that needed to be answered were

- What are the reasons for not using Video Games? (Educators)
- What should be focused on in designing an educational video game? (Students and Educators)
- Was there a difference between Educators and Students view on what should be concentrated on most when designing educational games?
- What are students' motivational factors for learning subjects?
- What do educators perceive as students' motivational factors for learning subjects?
- What are the most and least important motivational factors for playing video games? (Students)
- What Genres of Games are played by Educators and Students?

7.2 Survey Results and Analysis

The following are the results and analysis of the survey.

7.2.1 Use of Educational Video Games: Educators

This question was for both educators and students. Educators were asked about their use of video games and students were asked if they had used educational video games.

Educators were initially asked if they used Video games

Out of 52, 48 answered this question. 37 (77%) out of 48 stated they did not use Video Games in their teaching

Research Question1: What are the reasons for not using Video Games?

This question was used to ascertain the use of Educational Video Games by educators. The question asked if they used video games in their teaching and if they did not the reason why they did not use video games. Out of the 52 participants, only 48 answered this question “Do you use Video Games in your teaching?” 77% stated that they did not use video games in their teaching.

Figure 7.1 shows the breakdown of reasons of why Video Games are not used.

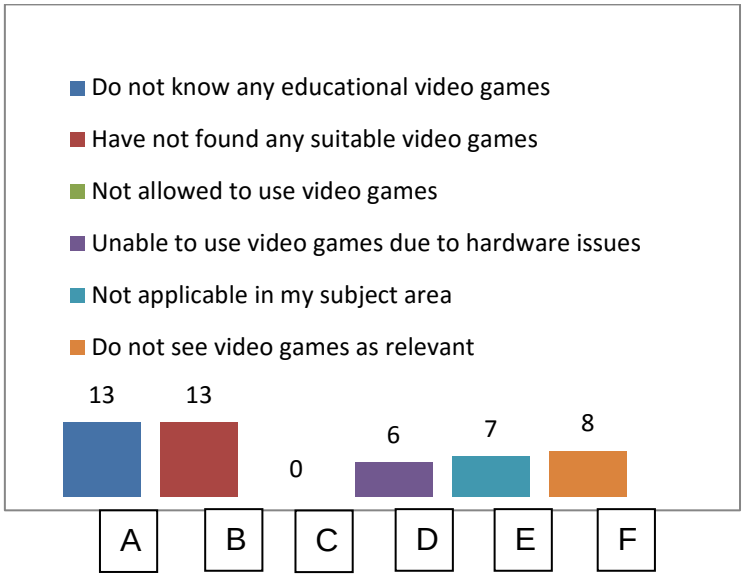


Fig. 7.1: Why video games are not used

From Figure 7.1 we can see that the two main reasons are “do not know any educational video games” and “Have not found any suitable video games”, with 13 of the participant of educators choosing both of these.

However to ensure that the result did not occur by chance, Chi-Square test for significance was used. The null hypothesis being that there is no preference shown to the reason for not using video games; whilst the alternate hypothesis states that there is a preference shown. Table 7.1 shows the observed and expected frequencies of each category.

The level of confidence chosen is 0.05 to ensure that there is a 95% chance that the conclusion is certain and only a 5% chance that the result has occurred by chance. The degree of freedom is 5. The critical value of chi-squared (x^2) is 11.07

	A	B	C	D	E	F	
fo	13	13	0	6	7	8	47
fe	7.83	7.83	7.83	7.83	7.83	7.83	
	3.41	3.41	7.83	0.43	0.09	0.003	

Table 7.1: Observed and Expected frequencies for non-use of video games

The value of 15.17 lies in the critical region, beyond the value of 11.07 (established for 95% confidence requirement and the *df* = 5). So there is 95% confident that the value does not occur by chance and the null hypothesis can be rejected. The conclusion is that the educators have shown preference for some of the 6 categories.

Looking at the table and doing a comparison between observed and expected the following can be deduced:

The two main reasons for not using educational video games are

- They do not know of any educational video games
- They have not found suitable educational games
    - The other reason that is higher than the expected frequency is that they do not see video games as relevant
    - The one factor that does not come into their choice at all, is that they are not allowed to use them

7.2.1.1 *Other Reasons for not using Video Games: Educators*

The educators were also asked to add any other reasons that they do not use Video Games. Only 6 added to this

- Tech Phobia
- Use COTS
- Don't have time to research
- Use some game elements like Wordshark
- No suitable game, they are mainly game playing rather than content
- Time is limited

The lack of suitable educational games or the lack of knowledge of suitable games supports the research done to date (Williamson, 2009)

7.2.2 Use of Educational Video Games: Students

Student participants were also asked their experience of using educational video games. The results shown in Figure 7.2, shows that 54 out of 84 students stated they had not played an educational game. The others gave various answers including ones that were not video games

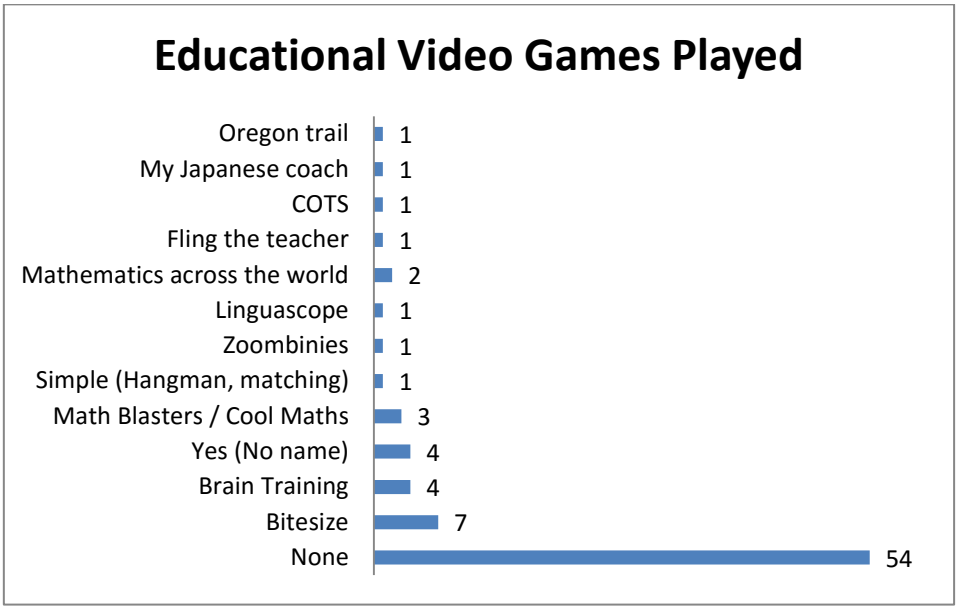


Fig. 7.2: Educational video games played by students

This small sample supports the research that this medium is still underused (Williamson, 2009).

7.2.3 Value of Video Games in Learning and as a Teaching Aid

Student participants were asked on their perception of the value of video games were for Learning. Educators were asked their value as a Teaching aid.

7.2.3.1 *Students: Value of Video Games for Learning*

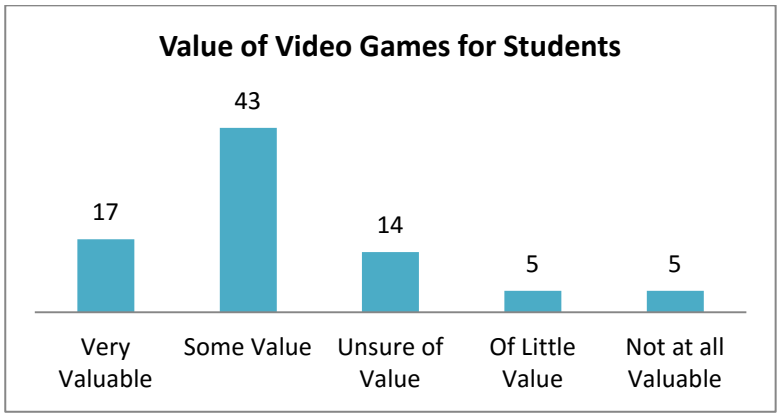


Fig. 7.3: Value of Video Games (Students)

Figure 7.3 shows that 43 out of the 84 participants of students felt that it was of some value, with 17 thinking it was very valuable and 5 stating "not at all valuable". 14 of them were not sure of the value.

7.2.3.2 *Educators: Value of Video Games as a Teaching Aid*

Figure 7.4 shows that 21 of the 48 participants of educators felt unsure of the value. Only 1 stated it was very valuable and 15 as valuable. 7 thought of it as little value with 4 stating "not at all valuable"

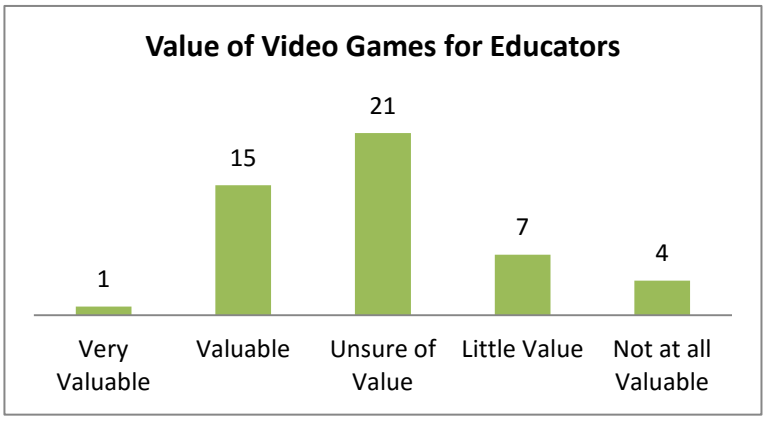
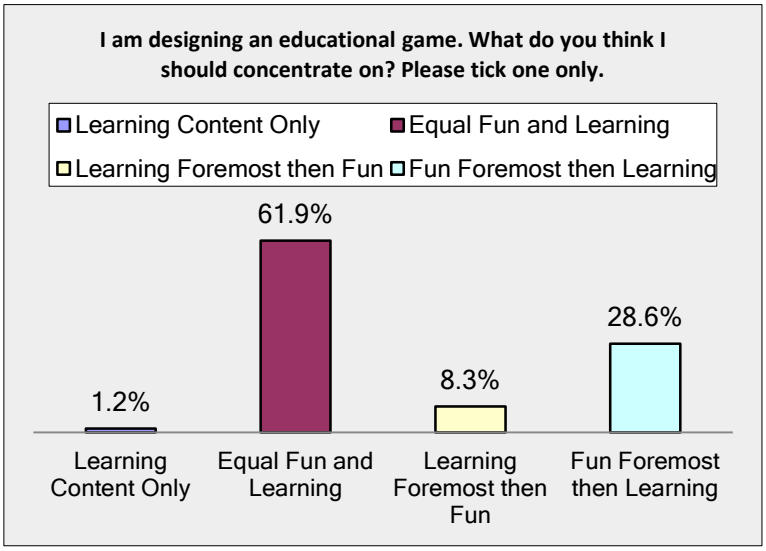


Fig. 7.4: Value of Video Games (Educators)

7.2.4 Design of an Educational Game: Students

Students and Educators were asked what should be focused on when designing an educational game. They had a choice of “Equal Fun and Learning”, “Fun Foremost then Learning”, “Learning Foremost then Fun” and “Learning Content Only”

Research Question2a: What should be focused on in designing an educational video game? (Students)



The students’ result can be seen in Figure 7.5, (61.9%) 52 out of 84 stated that “Equal Fun and Learning” was the most important. “Fun Foremost then Learning” had (28.6%), 24.

Fig. 7.5: Focus of Design (Students)

Chi-Square test for significance has been used here again, to ensure that the result did not occur by chance. The null hypothesis being that there is no preference shown for the design of educational video games; whilst the alternate hypothesis states that there is a preference shown.

H^o: There is no preference shown for the design of educational video games

H^1: There is preference shown for the design of educational video games

Table 7.2 shows the observed and expected frequencies for each of the categories

	Learning Content Only	Equal Fun & Learning	Learning Foremost then Fun	Fun Foremost then Learning	
fo	1	52	7	24	84
fe	21	21	21	21	

Table 7.2: Observed and Expected frequencies for Design (Students)

df = 4 -1 = 3, alpha = 0.05. Critical value of X^2 = 7.81 (established for 95% confidence requirement and the *df* = 3). The expected value for each category shows 21. It is clear to see that there were more participants grouped in the "Equal Learning and Fun" category than any of the other categories

The result of the chi-square of 74.57 was significant $X^2_{(3)}$ =7.81, $p < 0.05$, suggesting that there was a preference.

The value of 74.57 lies in the critical region, well beyond the value of 7.81. So there is 95% confident that the value does not occur by chance and the null hypothesis can be rejected. The conclusion is that students have shown preference for some of the 4 categories.

Looking at the table, and doing a comparison between observed and expected, the following can be deduced:

- The main concentration on designing educational video games is "Equal Fun and Learning"
- The other reason that was higher than the expected frequency was "Fun Foremost then Learning", but this was only just above at 24 of the expected frequency of 21.
- The other two factors were below the expected frequency

7.2.5 Design of an Educational Game: Educators

Research Question2b: What should be focused on in designing an educational video game? (Educators)

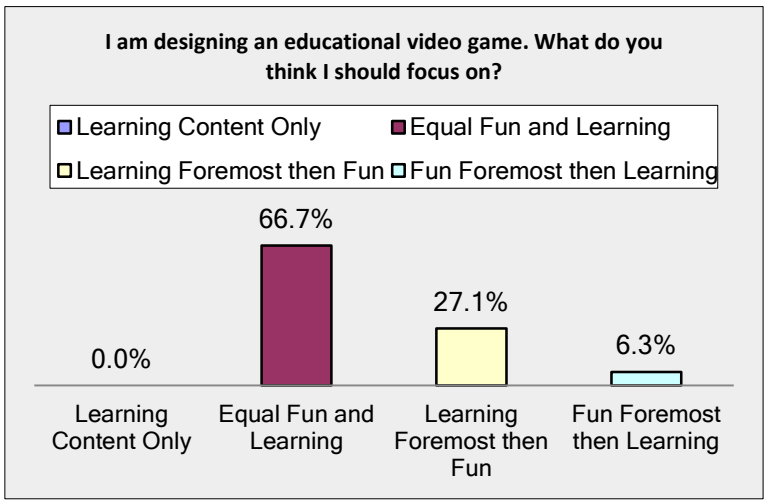


Fig. 7.6: Focus of Design (Educators)

The educators' results seen in figure 7.6 shows that (66.7%) 32 out of 48 stated that Equal Fun and Learning was the most important. It was interesting to see that at least 3 educators thought that Fun was more important than learning and that no one thought that learning content only was more important. "Learning Foremost then Fun" had (27.1%), 13.

Chi-Square test for significance has been used here again, to ensure that the result did not occur by chance.

Table 7.3 shows the observed and expected frequencies for each of the categories

	Learning Content Only	**Equal Fun & Learning**	**Learning Foremost then Fun**	**Fun Foremost then Learning**	
Fo	0	32	13	3	48
Fe	12	12	12	12	

Table 7.3: Observed and Expected frequencies for Design (Educators)

The result of the chi-square of 52.16 was significant. $X^2_{(3)} = 7.81$, $p < 0.05$, suggesting that there was a preference.

The resulting value of 52.16 lies in the critical region, well beyond the value of 7.81. So there is 95% confident that the value does not occur by chance and the null hypothesis can be rejected. The conclusion is that educators have shown preference for some of the 4 categories.

Looking at the table, and doing a comparison between observed and expected, the following can be deduced:

- The main concentration on designing educational video games is “Equal Fun and Learning”
- The other reason that was higher than the expected frequency was “Learning Foremost then Fun”, but this was only just above at 13 of the expected frequency of 12.
- The other two factors were below the expected frequency; with no one scoring for the “Learning Content Only”

It appears that teachers and students both think “Equal Fun and Learning” was the most important factor, with 61.9% of students and 66.7% of teachers choosing this. This was a surprise, as in my initial discussion with the teachers’ focus group; they had stated that fun should come after the learning outcomes had been achieved.

7.2.6 Design of an Educational Game: Was there a difference between Students and Educators?

Research Question3: Was there a difference between Students and Educators’ view on what should be concentrated on most when designing educational games?

This looked at the differences of the two groups and used a chi-squared test for independence

Chi-Square test of independence

	Learning Content Only	Equal Fun & Learning	Learning Foremost then Fun	Fun Foremost then Learning	Total
Educators (fo)	0	32	13	3	48 (fr)
Students (fo)	1	52	7	24	84 (fr)
Total (fc)	1	84	20	27	132 (n)
Educators (fe)	0.36	30.55	7.27	9.82	
Students (fe)	0.64	53.45	12.73	17.18	

Table 7.4: Difference of design focus between Educators and Students

The numbers of Students and Teachers are not equal, therefore the fe in Table 4 is found by fe =fc*fr/n.

The result of the chi-square of 15.85 and $X^2_{(3)}$ =7.81, $p < 0.05$, suggesting that there was a preference.

The degree of freedom (df) = 3, alpha = 0.05. Chi-square value of X^2 = 7.81. This shows that there is a difference between educators and students preferences.

Looking at Table 7.4, we can see that:

- For students: The observed frequencies that are higher than expected are
  - "Fun Foremost then Learning" with observed frequency of 24 in relation to the expected frequency of 17.18
  - "Learning Content Only" with observed frequency of 1 in relation to the expected frequency of 0.64

- For educators: The observed frequencies that are higher than expected are
  - "Learning Foremost then Fun" with observed frequency of 13 in relation to the expected frequency of 7.27
  - "Equal Fun and Learning" with observed frequency of 32 in relation to the expected frequency of 30.55

It does then appear that educators think "Equal Fun and Learning" is more important than students, which is a surprise. Students thought that "Fun Foremost then Learning" as opposed to educators who felt that "Learning Foremost then Fun", which was to be expected.

7.2.7 Motivation to learn a subject: Students

It was important to see what motivated students to learn a subject and what motivated them to play a game. These related to finding out the students' motivational factors for learning subjects and were asked to both students and educators. It was important to try to ascertain whether the perception of what motivated students to learn would be the same for both educators and students

Research Question 4: What are students' motivational factors for learning subjects?

7.2.7.1 *Overview Charts for Students' Motivational Factors*

These were ranked questions with same scores allowed for several choices

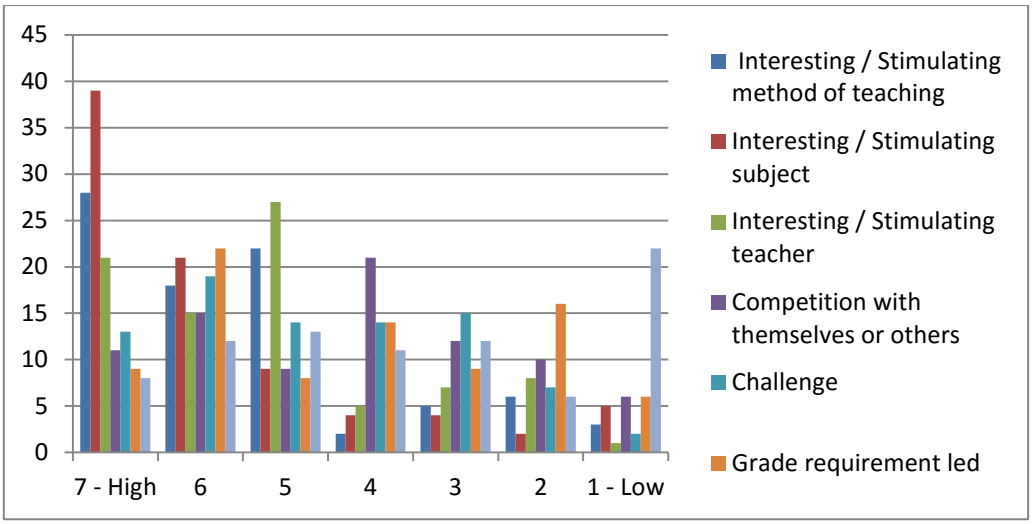


Fig. 7.7: Students' motivational factor for learning

Figure 7.7 shows the overall view of the results. "Interesting and simulating subject" scoring the highest and "Vocational Requirement" scoring the lowest

7.2.7.2 *Ensuring Rank Consistency*

To ensure that none of the categories were ranked consistently higher or lower than the others, it was decided to use the non-parametric Friedman test. This is very similar to Kruskal-Wallis test but it was felt this was more appropriate as the data was not from different groups. This was to ensure that the observed

differences amongst the mean rankings are more than mere random variability of the respondents' choices.

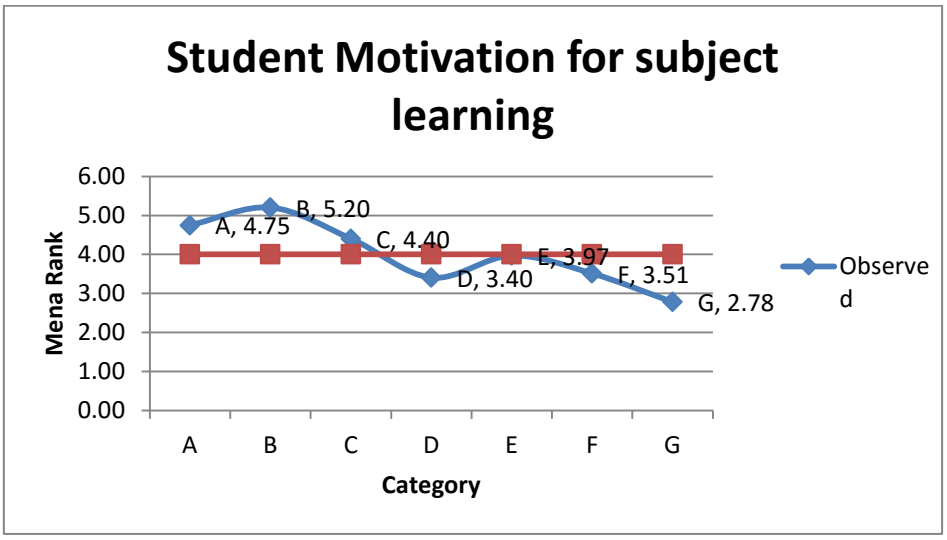


Fig. 7.8: Expected and Observed Frequency for learning motivation of students

Figure 7.8 shows the expected value of the mean of the ranks is 4 for each of the value **k** (this is the number of measures/result per participants).

7.2.7.3 *Calculating the measure of aggregate category differences*

Table 7.5 shows the Count, Sum and Mean of each category A through to G. Individual rankings of all the participants were used for the calculations.

	A	B	C	D	E	F	G	All
COUNT	84	84	84	84	84	84	84	588
SUM	399	437	370	286	333.5	295	233.5	2354
MEAN	4.75	5.20	4.40	3.40	3.97	3.51	2.78	4.0

Table 7.5: Aggregate category differences

n=84 [participants]

k=7 [measures/results per participants]

n**k**= 588

The formula for the sum of squared between-groups = $\mathbf{SS_{bg(R)}} = \sum [n_g(\mathbf{M_g} - \mathbf{M_{all}})^2]$ where (R) denotes it is ranked.

n_g = Number of respondents per category, M_g = Mean of the group/category and M_{all} = the total Mean

A: Interesting / Stimulating method of teaching	$84(4.75 - 4.0)^2 = 47.25$
B: Interesting / Stimulating subject	$84\ (5.20 - 4.0)^2 = 120.96$
C: Interesting / Stimulating teacher	$84\ (4.40 - 4.0)^2 = 13.44$
D: Competition with themselves or others	$84\ (3.40 - 4.0)^2 = 30.24$
E: Challenge	$84\ (3.97 - 4.0)^2 = 0.076$
F: Grade requirement led	$84\ (3.51 - 4.0)^2 = 20.17$
G: Vocational requirement	$84\ (2.78 - 4.0)^2 = 125.03$

Table 7.6: Results per Category

Calculating the Sampling Distribution of $SS_{bg(R)}$

The value of chi-square for the Friedman test is 76.48

Alpha =0.05; df= 7-1= 6. Critical Value of x^2= 12.59

The result of 76.48 was significant $X^2_{(6)}$ =12.59, $p < 0.05$, suggesting that there was a preference.

The value of 76.48 lies beyond the value of 12.59; so we are 95% confident that the value does not occur by chance and so we reject the null hypothesis, and conclude that the population of students do show preference for some of the seven factors. It can be therefore concluded that the observed differences amongst the mean rankings is more than mere random variability of the respondents' choices.

7.2.7.4 *Students' Results*

For subject motivation students stated they were motivated by "Interesting / Stimulating subject", "Interesting / Stimulating method of teaching" and "Interesting / Stimulating teacher", as their 3rd choice. All other factors such as "Competition with themselves or others", "Challenge" and "Led by Grade

requirement", fell below the expected value, with "Vocational Requirement" being the least important.

The results showed that:

Students feel they are motivated by

1. "Interesting / Stimulating subject"
2. "Interesting / Stimulating method of teaching"
3. "Interesting / Stimulating teacher".

Again all other factors fall below the expected value, with "Vocational Requirement" being the least important.

7.2.8 Motivation to learn a subject: Educators' perception of Students' Motivation

Research Question 5: What do educators perceive as being students' motivational factors for learning subjects?

These were again, ranked questions with same scores allowed for several choices.

7.2.8.1 *Charts for Students' Motivational Factors as seen by Educators*

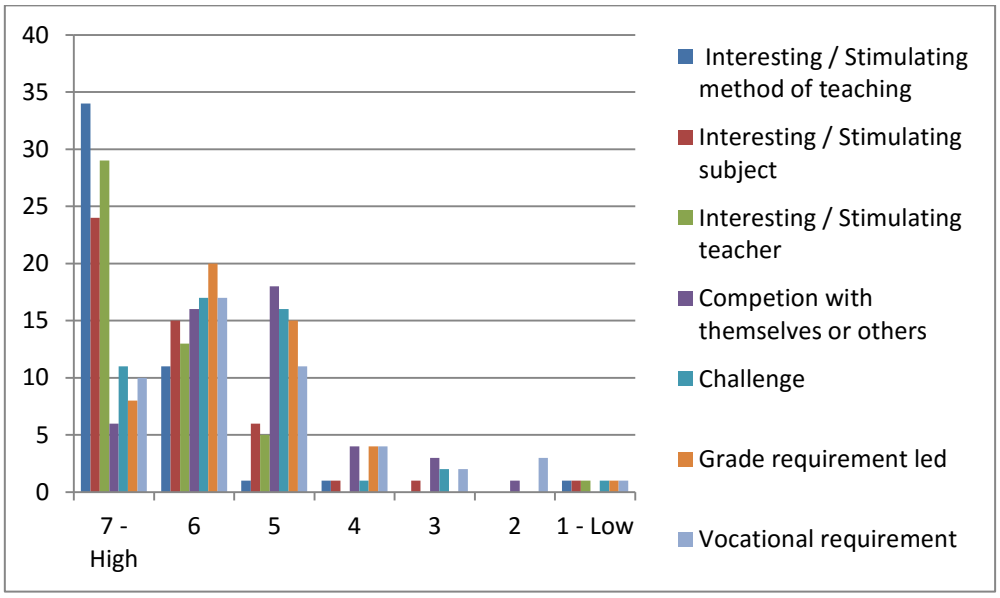


Fig. 7.9: Educators' perception of Students' motivational factor

Figure 7.9 shows the overall view of the results. “Interesting and simulating method of teaching” scoring the highest and “Competition with themselves or others” and “Vocational Requirement” scoring the lowest.
Educators felt that the main motivation for students wanting to learn subjects was “Interesting and simulating” method of teaching with a score of 34, followed by “Interesting and simulating teacher” which scored 29

As before, to ensure that none of the categories were ranked consistently higher or lower than the others, the Friedman test was used to ensure that the observed differences amongst the mean rankings is more than mere random variability of the respondents’ choices.
The value of chi-square for the Friedman test was Alpha =0.05; df= 6. Critical Value of x^2= 12.59
The value of 72.49 lies beyond the value of 12.59; so we are 95% confident that the value does not occur by chance and so we reject the null hypothesis, and conclude that the population of teachers do show preference for some of the seven factors. It can be therefore concluded that the observed differences amongst the mean rankings is more than mere random variability of the respondents’ choices.

7.2.8.2 *Educators’ Results*

The results showed that:
Educators feel students are motivated by

1. “Interesting / Stimulating method of teaching”
2. “Interesting / Stimulating teacher”.
3. “Interesting / Stimulating subject”.

All the other factors fall below the expected value with “Competition with themselves or others” being the least important.

7.2.9 Students' Motivation to play a video game

Students were also asked to choose the most important motivational factors for playing a video game. The motivation aspects were taken from the research in Chapter 3 and 4. Though consideration was given to all the terms that were researched, Challenge, Competition, Fantasy were included from Malone and Lepper's list of motivational factor. Social Aspect was the term used to incorporate Malone and Lepper's Cooperation, with the Fellowship from Hunicke et al (2004). The Graphic and Aesthetics were to incorporate the original meaning of Aesthetics and that of Aesthetics of Hunicke et al. Storyline/Narrative was included as part of Schell's (2008), 4 main game design elements but the term is also found in the main categories of aesthetic experience found in Hunicke et al (20014). Achievement was added, as it appears in Gamification as one of the important factors (Kapp, 2012; Zichermann and Cunningham, 2011).

It was important to ascertain the most popular reason of why students were motivated to play computer games. It was also felt that finding the least popular reason for their motivation may be useful. In view of this, a ranking system was used.

Research Question 6a: What are the most important motivational factors for playing video games?

7.2.9.1 *Overview Chart*

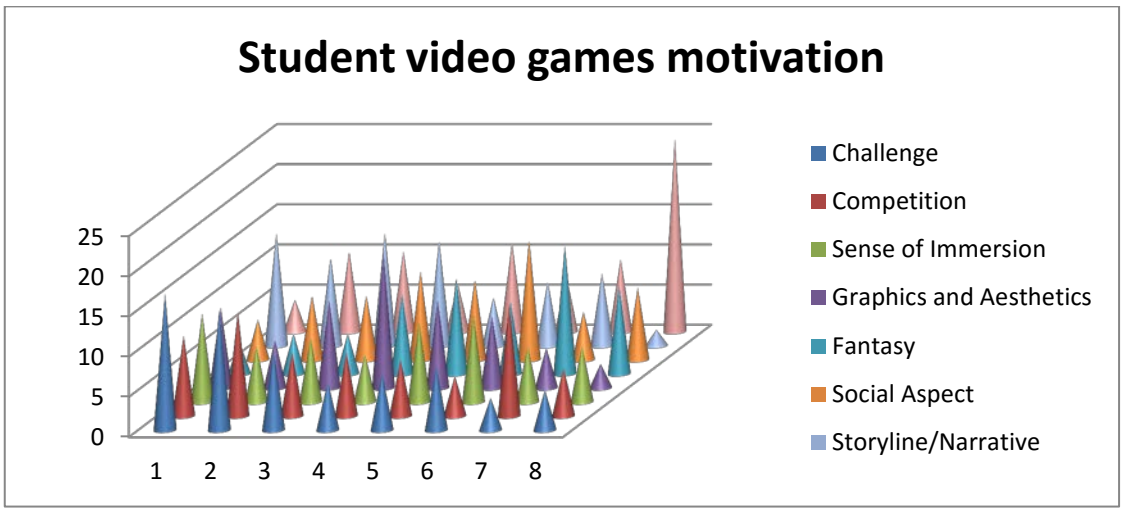


Fig. 7.10: Overview chart for Students' motivational factors for playing

Figure 7.10 shows the overview of the choices of motivational factors chosen by students. Rank 1 is the highest and rank 8 is the lowest

The highest and lowest rankings were then used. This could have been further tested by non-parametric tests for concordance or correlation but this was felt unnecessary in this instance.

7.2.9.2 *Data for Use of Video Games by Students (Most Popular)*

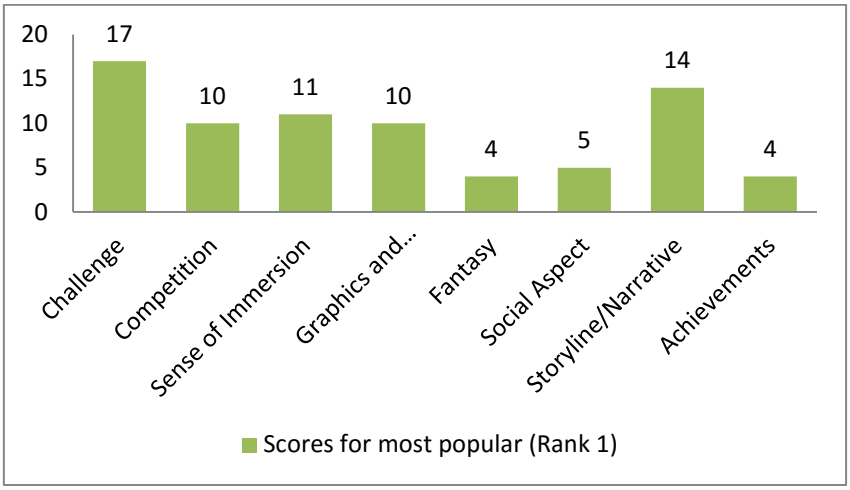


Fig. 7.11: Most important factors for playing (Students)

From figure 7.11, we can see that the main motivational factor for playing video games is Challenge. This is followed by, Storyline/Narrative.

However to ensure that the result did not occur by chance, Chi-Square test for significance was used. The null hypothesis being that there is no preference shown to the reason for not using video games; whilst the alternate hypothesis states that there is a preference shown. The level of confidence chosen was 0.05, the degree of freedom was 7 and the critical value of chi-squared (x^2) was 14.07.

The result of the chi-square of 17.06 and $X^2_{(7)} = 14.07$, $p < 0.05$, suggesting that there was a preference.

The value of 17.06 lies in the critical region, beyond the value of 14.07. There was 95% confidence that the value did not occur by chance and the null hypothesis can be rejected. The conclusion is that the population of students show preference for some of the 8 categories.

7.2.9.3 *Results for the most popular reason for playing video games*

The results were that:

- Challenge is the most popular, with Storyline/Narrative being the next popular
- Others that are higher than the expected frequency are Immersion, Competition and Graphics/Aesthetics and are also important considerations
- The least important factors are Social Aspects with Achievements and Fantasy tied in last place of preference

Challenge came out the most popular, with Storyline/Narrative being the next popular. Others that were higher than the expected frequency were Immersion, Competition and Graphics / Aesthetics and therefore were also important considerations

Interesting to see here that, though Challenge was one of the most important factors for playing a video game for students, it did not figure in one of the important aspects for learning a subject.

It was also interesting to note that Achievements was considered the least motivational reason for playing a game. This contradicts the essence and the raison d'être of Gamification with its use of points and badges as introduced in Chapter2.

It was also interesting to see that simulation was the lowest, as according to Aldrich (2009), educational simulations are most suitable for educational games.

7.2.9.4 *Data for Use of Video Games by Students (Ranked Least Popular)*

Research Question 6b: What are the least important motivational factors for playing video games?

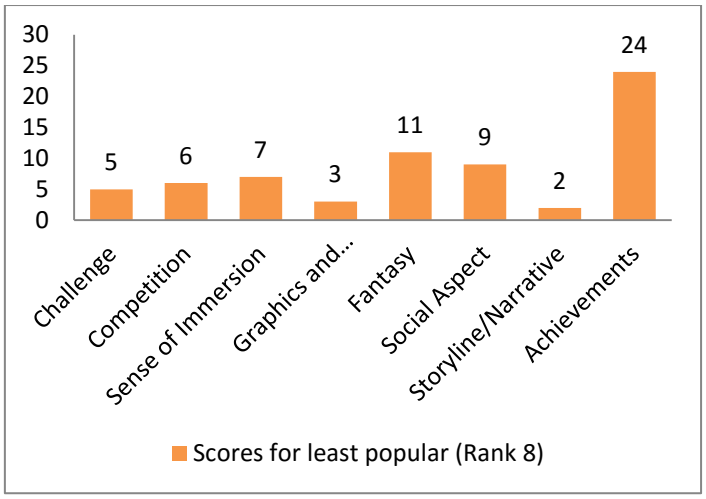


Fig. 7.12: Least important factors for playing (Students)

From figure 7.12 we can see that the least motivational factor for playing video games is Achievements. This is followed by Fantasy and Social Aspects.
However to ensure that the result did not occur by chance, Chi-Square test for significance was used.

(Df = 7; Alpha = 0.05; Critical Value of $X^2 = 14.07$)

The result of the chi-square of 40.57 was significant $X^2_{(7)} = 14.07$, $p < 0.05$, suggesting that there was a preference.

The value of 40.57 lies beyond the value of 14.07, so there is 95% confidence that the value does not occur by chance.

The results were:

- Achievements is the least popular choice
- Others that are higher than the expected frequency are Fantasy and Social Aspects which are of least consideration after Achievement.

7.2.9.5 *What other factors motivate you to play video games?*

It was also important to see if there were any other factors that had not been asked in the above question and an open-ended question was asked.

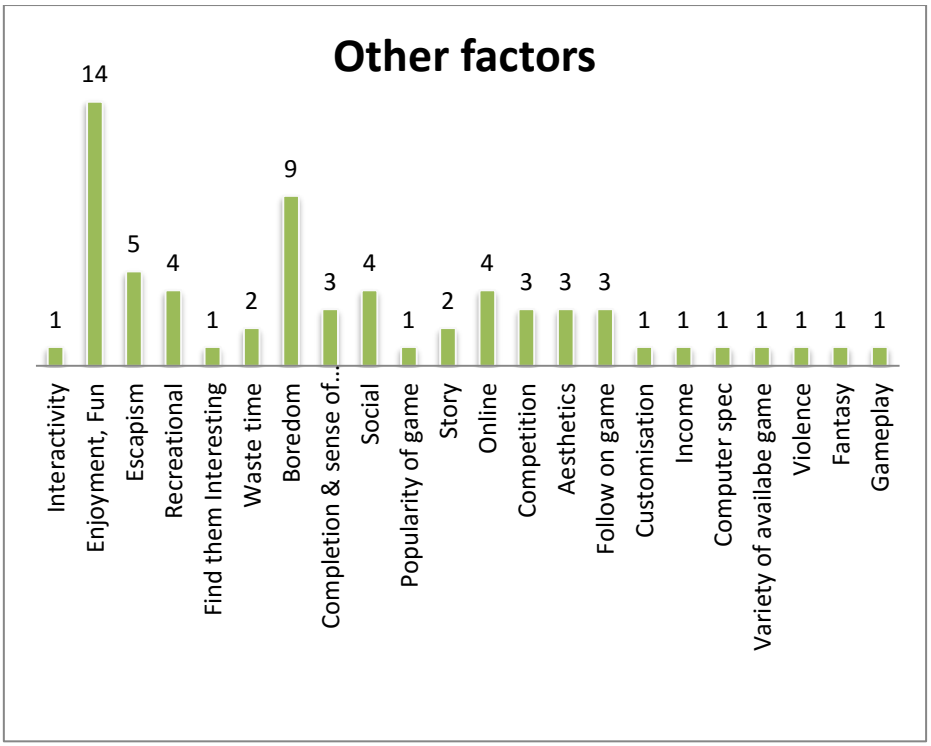


Fig. 7.13: Other factors for playing video games

This had the benefit of the students adding new ones but also brought to light that some words such as Fantasy, Aesthetics and Social Aspects were either, not understood or misinterpreted. Figure 7.13 shows that out of 56 who answered this question of other factors, “Enjoyment and Fun” was the highest at 14 and “Boredom” was another reason for playing games at 9. It is not surprising that Enjoyment and Fun was mentioned as most players will say they play because they find it fun or they play because they enjoy it. The aspect of fun was briefly covered in section 3.5.1, and explored further in Chapter 4.

7.2.10 Frequency of Game Genre choices by Educators and Students

Game Genre choice questions for both educators and students were composed of Multiple Response Variables (known as multiple-response categorical variables, MRCV). It was important that the respondents did not find themselves limited to just one variable choice. The aim was to ascertain the genre of games they played; often there is more than one genre of games favoured. Unfortunately, these types of questions do tend to cause a challenge in statistical analysis (Bilder and Loughin, 2009).

In view of this, these multiple response variable questions were included in a frequency table as it was felt that this was the most efficient method of analysing the data.

7.2.10.1 *What Genres of Games do Educators play?*

Research Question 7a: What Genres of Games do Educators play?

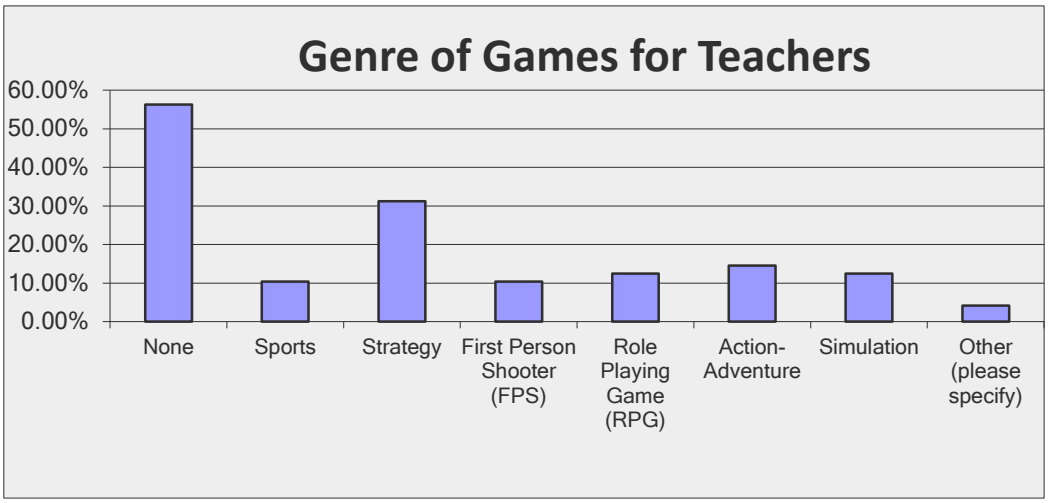


Fig. 7.14: Chart of Game Genres for Educators

From Figure 7.14, it appears that Strategy is the most popular type of game for those Educators who play games. However it is also worth noting that a large

percentage of educators do not play games in comparison to students, as shown in figure 7.15.

Table 7.7 shows N= 48 as the number of respondents (Cases) and Total Response Count was 73. The percentage of responses was calculated by Category Response Count / Total Response Count. Percentage of Cases was calculated by Category Response Count / N

N = 48 Category		Count	Percentage of Responses	Percentage of Cases
None Played		27	36.99%	56.25%
Sports		5	6.8%	10.4%
Strategy		15	20.5%	31.3%
First Person Shooter (FPS)		5	6.8%	10.4%
Role Playing Games (RPG)		6	8.2%	12.5%
Action-Adventure		7	9.6%	14.6%
Simulation		6	8.2%	12.5%
Other		2	2.74%	4.17%
		73	**100%**	**152.08%**

Table 7.7: Percentage of Responses and Cases of Game Play. (Educators)

It shows that 56.25% of the 48 teachers, who answered, do not play games. Of those who play games, 20.5% relative to the number of responses play Strategy.

The table shows that 31.3% of all the respondents mentioned Strategy as one of the genre choices, showing more played that genre than the others.

Sports and FPS were the lowest of choice of genre coming in both at 6.8% with only 10.4% choosing these.

7.2.10.2 *What Genres of Games are played by Students?*

Research Question 7b: What Genres of Games do Students play?

Students were also asked what genres of games they played. It was interesting to see that only 9.30% of the 86 students, who answered, do not play games.

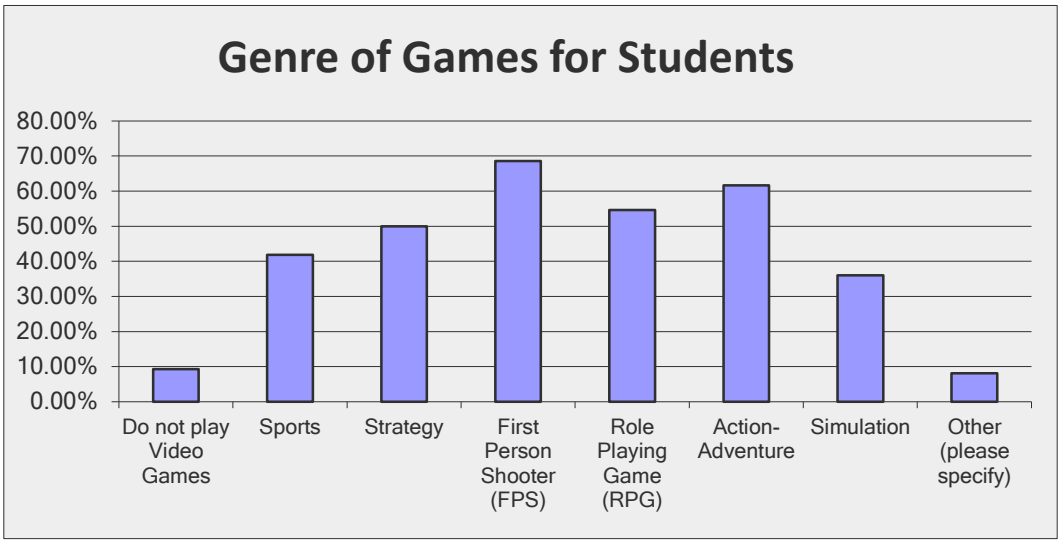


Fig. 7.15: Chart of Game Genres for Students

Table 7.8 shows that N= 86 as the number of respondents (Cases) and Total Response Count were 284.

N = 86 Category		Count	Percentage of Responses	Percentage of Cases
None Played		8	2.8%	9.30%
Sports		36	12.7%	41.86%
Strategy		43	15.1%	50.00%
First Person Shooter (FPS)		59	20.8%	68.60%
Role Playing Games (RPG)		47	16.5%	54.65%
Action-Adventure		53	18.7%	61.63%
Simulation		31	10.9%	36.05%
Other		7	2.46%	8.14%
		284	**100%**	**330.23%**

Table 7.8: Percentage of Responses and Cases of Game Play (Students)

Table 7.8 shows that FPS had 20.8% as the most popular with 68.60% of respondents having FPS as one of their choices. There was also a high choice of Action Adventure at 61.63% and RPG at 54.65% and Strategy at 50%. The lowest was simulation at 36.05% on selection of genre.

7.3 Summary and Discussion

This discussion section reviews the results of the survey in relation to the main research questions.

1. What are the reasons for not using Video Games? (Educators)
2. What should be focused on in designing an educational video game? (Students and Educators)
3. Was there a difference between Educators and Students view on what should be concentrated on most when designing educational games?
4. What are students' motivational factors for learning subjects?
5. What do educators perceive as students' motivational factors for learning subjects?
6. What are the most and least important motivational factors for playing video games? (Students)
7. What Genres of Games are played by Educators and Students?

1. What are the reasons for not using Video Games? (Educators)

It was good to find that the one reason that did not figure at all in the responses was "they weren't allowed to use them".

The two main reasons for not using educational video games were that educators "did not know of any educational video games" and they "had not found any suitable video games". These two reasons were tied to the main

reasons for educators not using video games, 13 out of 48 participants (26 in total), choosing these two as their main reasons.

The other reason that was higher than the expected frequency is that they do not see video games as relevant. This also correlates to the question given for the value of using video games in section 2.6 where 21 out of 48 (4 did not respond to this) were unsure of their value, not surprising as 37 out of 52 did not use video games.

The lack of suitable educational games or the lack of knowledge of suitable games supports the research done to date (Williamson, 2009).

Though only 6 added to the response to any other reasons, they are also worthy of note in that they were issues with concern of time and technology Phobia. The time aspect ; is one that seems to come up frequently; educators, especially in secondary schools do not have time to research what is available or are constrained by the time available to fit topics in by the curriculum. Some educators are reluctant to use games especially if they do not play games or understand the gameplay. This technology phobia as one respondent named it, is not uncommon amongst some educators; I have had first-hand experience of this trepidation or fear that some have, not just in the field of using games but technology or software in general; it also has to be noted that this is found amongst a range of experience and age.

2. What should be focused on in designing an educational video game? (Students and Educators)

Research Question2a: Students

The main concentration on designing educational video games from students was “Equal Fun and Learning” with (61.9%), 52 out of 84 participants choosing this. “Fun Foremost then Learning” was only just higher than the expected frequency and therefore also a consideration by the student participants, with (28.6%), 24 out of 84.

Research Question2b: Educators

The main concentration on designing educational video games from educators was “Equal Fun and Learning” with (66.7%), 32 out of 48 participants choosing this. “Learning Foremost then Fun” was only just higher than the expected

frequency and therefore also a consideration by the teacher participants, with (27.1%), 13 out of 48.

3. Was there a difference between Educators and Students view on what should be concentrated on most when designing educational games?

The conclusion is that there is a difference between educators and students' preferences. It does then appear that teachers and students both think "Equal Fun and Learning" is more important than anything else which was a surprise; as it was expected that educators may put more emphasis on "Learning Foremost then Fun", as this is what came out in the focus group discussions. It was interesting to see that educators actually had 66.7% as opposed to the students 61.9%. For the second choices that were important, Students thought that "Fun Foremost then Learning" as opposed to teachers who felt that "Learning Foremost then Fun"; this difference was to be expected as educators who did not choose "Equal Fun and Learning" were more likely to choose "Learning Foremost then Fun" rather than "Fun Foremost then Learning".

The interpretation of what fun means is dependent on who you are; fun to a gamer means engagement, immersion but to an educator it means playing and not learning.

The word engagement instead of fun could have been used but the interpretation would have been different. Educators could have assumed it meant engagement with the subject being taught rather than engagement of the whole medium. Students on the other hand might either have related it to study mode rather than play/learn mode, however some may have thought of the question as relating only to a game; either way it would added more confusion. Though gamers understand the word fun in respect of a game meaning as engaging and enjoyable, educators do tend to think of it as previously sated as possibly playing and not actually engaging in the topic. As shown in Chapter 4 Section 4.3.1, the aspect of the term fun is open to interpretation. The aspect of defining fun in respect to game design is also further explored in chapter 7.

4. What are students' motivational factors for learning subjects?

Students feel they are motivated to learn a subject by "Interesting / Simulating subject" first, followed by "Interesting/Simulating method of teaching", and then "Interesting /Simulating teacher".
All other factors such as "Competition with themselves or others", "Challenge" and "Led by Grade requirement", fell below the expected value, with "Vocational Requirement" being the least important.

5. What do educators perceive as students' motivational factors for learning subjects?

Educators feel students are motivated to learn a subject by "Interesting / Stimulating method of teaching" first, followed by "Interesting / Stimulating teacher", and then by "Interesting / Stimulating subject". All the other factors fall below the expected value with "Competition with themselves or others" being the least important.

Discussion of Research Question4 and 5

It was clear that all the three main factors considered as important to the motivational consideration for learning was the same for both groups. What was interesting is that students considered "Interesting/Simulating subject" as the most important factor, whilst educators classed this as the third most important factor. Educators classed "Interesting / Stimulating method of teaching" as the most important factor and students felt this was the second most important factor. Student felt that "Interesting / Stimulating teacher" was only the third consideration, whereas educators placed this as the second most important factor.
It is perhaps due to the expectancy of education that educators feel that if students did not learn then, it must be due mainly to either their method of teaching or themselves rather than subject; whereas students felt that the interest in the subject was the most important. If a game can therefore initially

extrinsically motivate them to play, it might spark their curiosity and interest to get them to be intrinsically motivated in a subject.

6. What are the most and least important motivational factors for playing video games? (Students)

Interesting to see here that, though Challenge was one of the most important factors for playing a video game for students, it did not figure in one of the important aspects for learning a subject. This could be due to the fact that Students who enjoy a challenge when playing games do not mind failing in game as the game does not judge their intellectual ability or measure it, it only test their ability to find the right strategy or test their ability to learn new skills. Whereas failing in a challenge in a subject is seen as measuring their intellect. This supports Dweck's view on performance versus goal (Dweck, 2011)

7. What Genres of Games are played by Educators and Students?

It was clear from the results that a large percentage of Educators (56.25%) in comparison to Students (9.30%) do not play games. It is difficult to understand either how games could benefit or what types of games are suitable if one does not play games; in order to understand the concept of games, one has to play them (Egenfeldt-Nielsen et al, 2013).

The choice of Genre is worthy of note, with FPS being the most played by Students and Strategy being the choice for Educators. The choice of FPS however would not have been a suitable conduit to base a Serious Game as Whitton (2007) points out. An RPG or an Adventure style game is more suitable style as its framework would be conducive to accommodate both the pedagogy and gameplay required.

These perspectives not only confirmed the research so far in the review but also aids in understanding the difficulties faced in designing and developing an educational game. Was it actually possible to design a game that would be considered suitable for both students and educators?

Educators wanted to concentrate on the learning outcomes, students wanted to concentrate on the playability and fun aspects.

Part V: Design and Development of Weogorna Civitas

"In every real man a child is hidden that wants to play." (Friedrich Nietzsche)

8. DESIGN AND DEVELOPMENT

One of the greatest challenges in designing an educational game is to marry the expectations of students with the requirements of educators. This design and development took the view of Marsh's interpretation of what a Serious Game is as mentioned in Chapter2, Section 2.4.2 and aims to encapsulate in its design and development, all the characteristics of games; entertainment games with a purpose (Marsh, 2011).

This chapter covers the design and development of an educational Serious Game, within the framework that was initially defined in Chapter 6.
Though some of the design elements are covered, the emphasis is on the design and development of the educational content. This takes into account the current Game Based Learning Theories and incorporates aspects of Game Design Principles mentioned in Chapter 4.

8.1 Weogorna Civitas: Design and Development

The design and development phase of the game Weogorna Civitas (Latin name for Worcester A.D. 691) was in 3 phases. The first was a simple prototype that included the terrain and the main start of the game; this bypassed the main Oblivion game. Protoype1 was to facilitate the initial discussions covered in Chapter 6 and had very little interaction but showed the participants what could be achieved (especially those who had no previous concept of open world RPG or games in general).

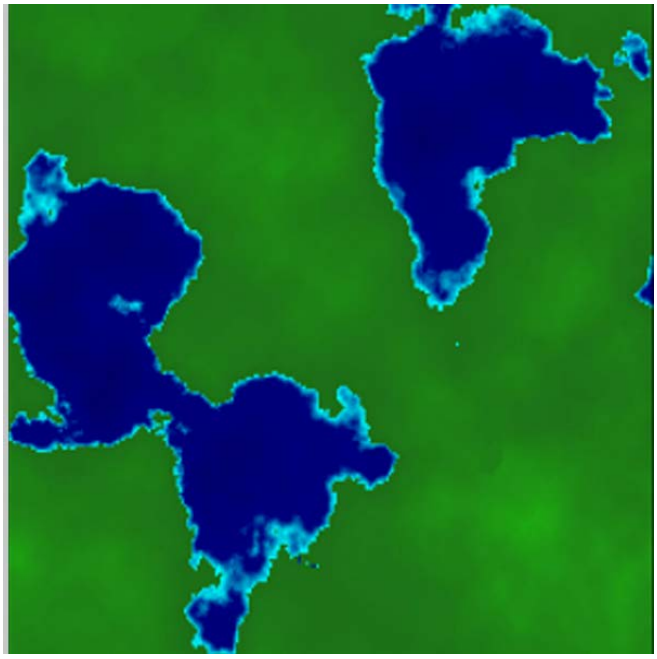
Prototype 2 was that of Weogorna Civitas built on prototype 1's main world. It was designed collaboratively with game design students and the design was then developed by the researcher. The aim of this was to get an insight to the views of students in designing a main game.

The final prototype 3 was set in Khemia, a province of Weogorna Civitas. A new world was attached to the original prototype 2. The rationale for this was to bypass the start of prototype2 for several reasons. Prototype2 had been used for conferences and work in progress and included elements that were not suitable or effective for final testing; quests that had no educational content, areas that could be accessed that were used primarily to show certain elements and a vast area that was either partially complete or included unfinished terrain. It was also felt that the start, which incorporated the player's tutorial for the basics and included the ability for the player to choose their race, skill, gender and other elements would require too much time for the uninitiated to get to grips with. Normally an RPG is played over several hours, and though part of the feeling of being immersed and owning the player is paramount, this part would be too time consuming in a test situation and would ideally require time for the player. This division of the two areas however showed that it would be easy to add different worlds on top of a main game. The main province of Weogorna was bypassed and the player started on a ship in Khemia and no link was provided for them to access it. This of course meant that Khemia had to be built from scratch.

Though the aim of this research does not aim to cover the way the game was developed, it was important to show how an RPG system worked and the complexity of design and development considerations in applying the theory of GBD. In order to facilitate an immersive experience it was important to weave, AI, dialogue and interaction with the world as well as incorporating sound pedagogical elements

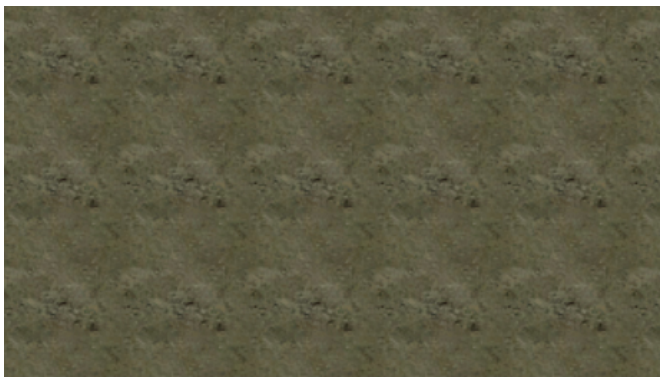
8.2 Prototype 1 – Weogorna Civitas: Initial Test World

Prototype 1 included a map and various locations including the Fisherman's Wharf which was the starting point. Figure 8.1 shows the initial design for prototype1



The world was designed from scratch using Fractal World Explorer that came with Fractal mapper. This was used to generate a relief map that was then exported and basic adjustments made to ensure that there were no tears in the world and that the terrain was usable.

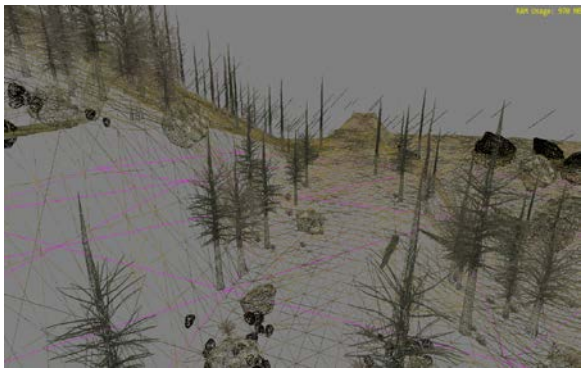
This program worked better than trying to generate heightmap in Oblivion editor. The generated terrain size was 1024x1024. Once the land and water was generated to make a land mass I was happy with, I then had to ensure that the water level was lowered to the requirements of the tescs editor (4096 metres is the default water height used in the editor). This was then exported as a 16 bit binary and saved in the directory to be imported in the game for adjustments



Once the above was complete, this was the starting point to generate the textures, add the elements to the world, including any NPC. The final phase after the world building would be to design and build a map

Some of the land textures were generated by the editor, but some trees, rocks had to be hand placed. Buildings, animals, NPC, dirt roads and fencing all had to be placed by hand.

Adjustments to the world had to be made by moving rocks and trees to place buildings etc. Some areas like the dirt road and land textures also had to be done by hand, especially to ensure smooth integration.



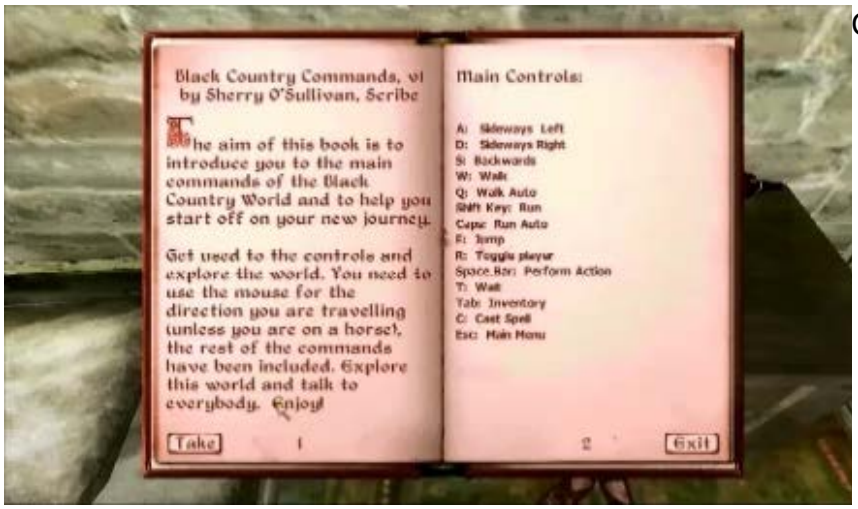
Once the initial world was complete, a map was made. The first map was very basic but was necessary as the player needed not only to know where he was but also have the ability to travel. Further details are in Appendix 3

Fig. 8.1: Images of initial prototype

An initial Quest to the whole world of Weogorna Civitas was added. This, in actual fact, is the tutorial quest. On starting a new game (the original Oblivion game having been bypassed), you are given basic instructions on how to move and are asked to give yourself an identity etc. Elder1 comes to seek you out and greets you and tells you that you need to go to the Academy and report to the teacher's guild. But he advises that you first need to know the rules and directs you to the nearby cottage and tells you to explore and find the rule book. The rule book, once activated will move the quest on, if not the Elder will inform you again, that you need to read the book. If you have obtained the book, the quest will move on and new topics will open, including directions, the use of the horse. The elder will acknowledge that you have the rule book and advise you to ensure that you explore, read and talk to the people you meet, so that you know how to proceed or get help. Figure 8.2 shows the initial start-up to the game

Meet the Elder who will guide you

The ability to change your Player Avatar



Check the rule book

Help with the controls

Keeping track of progress and ensuring you know what to do

Fig. 8.2: Initial start-up in game.

This tutorial enables the player to have a basic understanding of the world, how to interact with it and also understand how to use the controls; this is especially important for those who are either not familiar with games or those whose primary game modes are the consoles and are not used to PC controls (Calvillo-Gámez et al, 2009).
This was used as a main start in prototype 2.

The following section shows the details of prototype2, Weogorna, a province in the world of Weogorna Civitas.

8.3 Prototype 2 - A Collaborative Study: Students as Designers

This study initially started as a focus group to ascertain students' perspective on educational games but developed into a working relationship with media students helping to design aspects of the world and this co-operative working relationship added a new dimension and depth to the research. This enabled the design of prototype 2 and was phase 2 of the study as mentioned in Chapter 5, Section 3.
In an attempt to harness the potential of game based learning (Barab, 2005), students from a 1st year BTEC Game Design (Media) course at Dudley College were asked to

help design elements of the Main World. This also gave the opportunity to the Game Design lecturer to be involved and for the students to learn some aspects from my own design and development process. It seems a good solution all round; on the whole, eager participants, 2 extra helping hands and a grateful researcher.

While Prensky states, “Students as Designers and Creators of Educational Computer Games Who else?” (Prensky, 2007), there has been little research on the involvement of students in educational game design. Working with students as well as educators may help us understand how these games should be designed for effective learning (Price, 2009).

“It also appears crucial that, in the case of bespoke educational video games, students be included in the development process and introduced to new or unfamiliar game mechanics through a training module” (Felicia, 2011).

With this in mind, the student focus group were allocated to become designers to help design parts of the main game world.
The group was composed of 15 First Year BTEC Game Design students from Dudley College. In order to make them feel that they were getting something in return, they were asked to do various tasks in Working Together Key skills. The sessions were 1 hour each week over 10 months, with the aid of myself as researcher, their key skills tutor and the intermittent intervention of the game design lecturer.

8.3.1 Design Tasks

The choice of media students as opposed to computing ones was felt to be an important aspect in the design process; media students were more likely to concentrate on aspects of the storyline, quests, characters and aesthetics rather than putting most of the emphasis on pure game mechanics and coding of the game.

Some of the group were asked to help design the backstory and main story of the game; a story line to tie both areas increases the immersion which is paramount in the design of a good environment in this genre.

Their brief was to design some elements of the main open world. There were 4 groups of 2-4; 3 were given the task of designing quests. The 4th group were given the task of supplementing the main storyline and coming up with names for the villages and towns; some existing and some that may be added by the other teams. It was important that a good storyline and use of narrative was made within the design of the game (Dickey, 2006; Klopfer, 2009), this will not only bring cohesion to the whole framework but also help to realise the true spirit of the genre.

The team were given a quest template designed for them, but were also asked to include any concepts or additional workflow they wanted to use. The open world had already been designed to some extent and they were given a basic map of the world, Figure 8.3

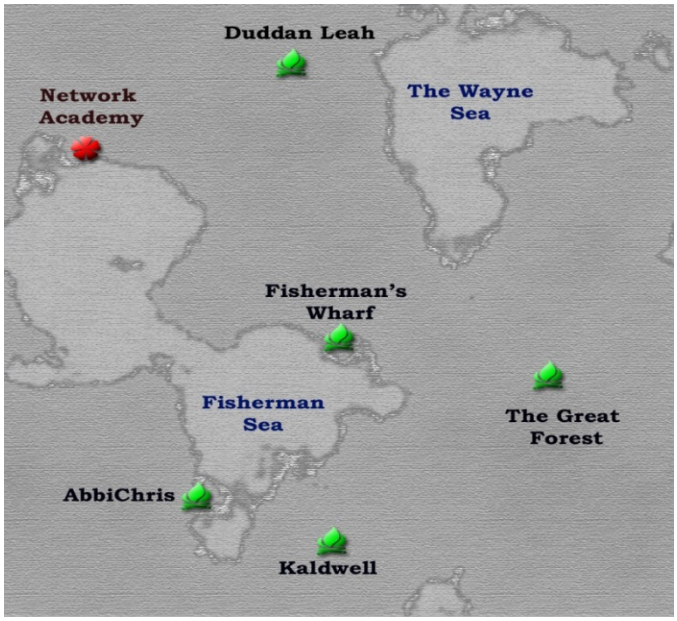


Fig. 8.3: Initial Weogorna map

In order to maintain the verisimilitude of the game, the characters and names of most of the places have a medieval theme.

The researcher's role was to look at the initial designs and advocate any required changes with regards to the following:

- Flow of quest
- Game mechanics
- Ethical issues

- Appropriate content
- Game engine limitations
- Scope of project
- Add additional learning content where it was needed
- General advice and guidance

Once the design elements were completed or at a stage for the researcher to start development, the design was discussed with the team and then the development process started. It was often found that changes needed to be made from both the designer and developer's perspective (in this instance the researcher); thus an iterative and a long drawn out process began.

Once the main villages had been developed, students who participated in the design of the quest chose their houses and helped develop one of the main characters, Skye. Some of these are shown in Figure 8.4. This helped give them a feeling of ownership and helped them understand the editor.

Initial Design of NPC Skye

Skye: Developed by student

AbbiChris Village Kaldwell Town

Fig. 8.4: Development of student design concepts

As these were media students very little development was taken on at this stage with the students, apart from basic character development that required no coding and very little manipulation of the editor. Some attempt was made to involve and teach media students, aspects of the development engine, the following year. Though, students learnt some aspects of how to use the editor and developed basic interaction it did not add to the study or contribute to this research or development and will therefore not be covered here.

The design for the main game had to be interspersed with learning intrinsically woven within various quests, (Habgood et al, 2005b) thus ensuring the Csikszentmihalyi flow of the game in order to maintain the student's motivation (Fabricatore, 2000). It also needed to incorporate Floyd and Portnow's (2008) tangential learning throughout the various quests whilst maintaining the thread of the storyline and the essence of an RPG.

The design stage was a slow iterative process between the designers and researcher to ensure that content, game design principles and ethical issues were addressed. Left to their own devices, students would have carried on designing some unsuitable aspects; for instance one would have found a well-known celebrity TV chef battered in a kitchen. Students felt that fighting of some sort had to included, our compromise was to allow fighting rats and skeletons in dungeons only. The guidance was required for aspects of game design concepts as well as including the educational elements.

This study could have been conducted as a focus group but because it evolved with the group becoming participants, it became a time consuming process, however without social interaction, one misses a lot of valuable insight into a field that requires the researcher to understand about learning, motivation and the interaction between humans and technology.
The group managed to complete the three quests, though only 2 were eventually developed.

The design started in September 2011 and development completed by April 2012. The answer to Prensky's question of who better to design than students has to be, they need an enormous amount of guidance to achieve this. It is therefore safe to make the assumption that not all gamers can make games but it helps to understand the essence of a game.
Students were not forthcoming with the amount of detail required to design in depth quests. The educational elements were the least popular, students generally commenting "add science stuff here"; however they did try to ensure that the flow of the game was maintained throughout their quest. The researcher had to design the educational elements to fit seamlessly into the quests.
The most complex quest designed and developed, "Strange Happenings" included a fairly complex quest that was Science based and whose main character was an alchemist, across multiple locations including Worcester Cathedral on Earth, books and journals to inform the player and rewards along the way. It incorporated a Binary Puzzle and an Alkali Metal Puzzle. This was not used for the final prototype due to problems the engine had rendering the complex Cathedral Model; an error of judgement on the part of the researcher in designing a non-optimised model.

The developed design were showcased by the students at a symposium at Worcester University and the findings of the design and development were presented by the researcher at the iGBL 2012 Conference in Waterford, Ireland

8.4 Prototype 3 – The province of Khemia: The world of Chemistry

Prototype 3 was the final prototype and used in the final study and evaluation covered in Chapter 9. The world was set in Khemia, a province of Weogorna Civitas and had a theme of Chemistry running through the world.

The main quest is set in Khemia a province of Weogorna Civitas, as shown from the in-game map designed for this world in Figure 8.5. The aim was to free the elements that had been held by Vierstein the evil Alchemist. The prototype only included saving one of the elements; Hydrogen.

Fig. 8.5: Map of Khemia

The player starts off in the port of Gar Darihm, having arrived by ship from Weogorna and proceeds to the first quest; solving puzzles to aid their progression. This is only one of the quests that would encompass the game and includes sub-quests.

The main quest designed and developed includes the following stages:

8.4.1 Stages of the first main quest

1. Arrival at Khemia shown in Figure 8.6
    a. Meet with the NPC Belroth
    b. Direction for next phase (see the Arch-Mage)
    c. Get horse provided by Belroth

Fig. 8.6: Arriving at Khemia

2. Khemia University
    a. See the Arch-Mage to get information and the key to the Academy Croft
    b. Go to the University dungeons (Academy Croft)
    c. Solve the Metalloids puzzle
    d. Get the ring
3. The Alchemist Height
    a. Help Brother Duncan with the pictures
    b. Get a reward, a room of your own
    c. Further information about where to go and whom to see
4. Cedal Town
    a. Find the NPC
    b. Get the information of where Hydrogen is located
5. Iclafese Ruins
    a. Solve two puzzles to get to Hydrogen
    b. Rescue Hydrogen

Though designed in a linear fashion, it is important to ensure that the player can actually go to any part without going to each phase. However, the player will eventually visit all the main areas in order to ensure all the puzzles are completed.
In order to give the player a sense of agency, the main quest was developed so that they could do the different parts of the quest in a different order. This meant having the 3 main elements separated from the main quest but controlled by the main quest. This way the main quest acted as a control to the stages to the rest of the mini quests. If they got to the last location, they were unable to enter until they had done the others. This was required as the last location of Iclafese Ruins, held the elemental Hydrogen and rescuing Hydrogen would end the main quest.

A main quest was designed to provide access to the others. This quest enabled the game to bypass the main Oblivion game; this also enabled me to check what stage the whole quest was at any given time. There were 3 mini quests that were incorporated into the main quest. Quests are also used to add random conversations that may occur between NPC and fed in at certain times of a particular stage.
A commentary quest was added, though this was only used twice in the final prototype, it ensured that it could be expanded as a separate entity. The aim of this was to include trigger points that would trigger a voice dialogue that gave supplementary information to the player much like a tourist information board. Each object when triggered had a dialogue that was played, the music was turn off until the dialogue was finished. This commentary addition could be used throughout if this was expanded upon. The player had the ability to switch this on and off by equipping themselves with a ring that was in their inventory. The ring was made into an essential item so that they could not lose it or throw it away by mistake.
Use of triggers are a useful way of not just triggering commentary but were also used to advance quest stages either through markers in certain areas, by dialogues or certain objects.

8.5 Design of the puzzles

There were three main puzzles in the game all located at various locations within Khemia. Some details of the rationale of the puzzles have been included

8.5.1 Puzzle01: Metalloids

Location: The Academy Croft situated in Khemia University.
Requirement: a key to get into the croft from the University Arch-Mage
Clues: Scrolls and a book, a real book on elements was also provided.
Main NPC: Khemia's Arch-Mage
End Result: A ring and items of value

1. Quest Start.

As you approach the university, a mage is at the main entrance. If you ask her where the Arch-Mage is she will inform you he is in the library upstairs of the large dome like building. Once you have found him, he tells you that Vierstein the Alchemist has some of the elementals as prisoners and others have joined his rank. You need to find the ring from the Academy Croft, which will enable to get the trust of the Alchemists at the Alchemy Heights. He gives you a key for you to access the croft
If you have done the Alchemy Heights quest first, then the ring is still required to get the information from Brother Duncan who will give you the next step of the quest.
Once you have access to the croft, you need to locate the puzzle room shown in Figure 8.7, fighting the rats and skeletons as you go through the croft to get to the puzzle room.

Fig. 8.7: Metalloid puzzle room

2. The Task

The aim of this is to find the Metalloids on a floor puzzle. Metals and Metalloids are included in the puzzle.

The scroll contains a clue as to what is required “Beware traveller, though you can walk on the path in any order; my path is that of Metalloids”. This gives the player the clue that it does not matter which order they activate the floor triggers.

“Walk the path to proceed you need to find 5 of my Metalloid elements”. This gives them the clue that they need to find 5 Metalloids in order to get through the portal to get to their objectives

“If you are stuck, reset your path”. This enables them to reset the puzzle with a reset button found at the bottom of the stairs.

3. The way it works

There was also a book in game as well as one supplied to players out of the game.

Two counters were set up, one to hold the number of correct elements stepped on and the other variable to hold the number of incorrect ones. This enabled the player to know how many they got right, when they pulled the lever to activate the area where the ring and other items are. If they got the appropriate ones then the door would open when the lever was pulled.

This gave them enough challenge, feedback and scaffolding for them to complete the puzzles. Extra scaffolding was also given to those who needed it by either a more experienced peer or the researcher. This could have had an NPC act as a mentor but there was no time to develop the depth required to ensure that it would help.

8.5.2 Puzzle02: Match the plaques to the scientist paintings

Location: Alchemy Heights, the main hall.
Requirements: Place the correct plaques on the correct portraits.
Main NPC: Brother Duncan tells you what you have to do.
Clues: Brother Duncan and books.
End result: Various items and progression

1. Quest Start

The Alchemy Heights has three separate areas but you enter through the main hall where the main quest can be found. If you don't ask or talk to an NPC but come across the plaques, a message will appear with the following "I wonder what all these signs are for? Maybe I should go and ask". If you have already asked about this or you state that the Arch-Mage sent you (depending on which one you do first), this message won't appear when you activate them.

An example of a painting (it is framed in the game) and the plaque (the image is put on a board in game) that needs to be placed underneath the correct painting

Fig. 8.8: Matching plaques to scientists.

2. The Task

The aim is to collect the plaques and then to place the plaques under the appropriate paintings of different scientists. Once you feel you have placed the plaques in the correct position, you then go to Brother Duncan who will check. He will walk around and ponder at the pictures before advising you if you placed them correctly or not. If you have not placed them correctly, he will give a book with the images (they are similar but not the same). If on your second attempt, you fail to get them right, he will place them for you.

3. The Reward

If you get them right, you get your own room to use as you wish, situated in the West wing of the Alchemy Heights and the information that you need to go and see Ella in Cedal Town as she has some important information that may help in your quest. If you get them wrong, you still get the information and a bed but not your own room.

8.5.3 Puzzle03: Element symbols word puzzle

Location: Iclafese Ruins
Requirement: Visit Ella in Cedal Town for map
Clues: Scrolls with clues
Main NPC: Elemental Hydrogen
End Result: Rescue Hydrogen

1. Quest Start.

You needed to have visited Ella in Cedal Town to find the location of the Iclafese Ruins. If you came across this by chance, you would not be able to enter, unless you had completed the other two puzzles. This ensures that the game has some form of focus and that all the quests have been completed; it was also important as this was the last quest that finished the prototype game.

Iclafese Ruins was the last main challenge for this prototype. As well as solving two puzzles (Figure 8.9), you had to navigate your way through a ruined underground area by going through a bridge with falling blades and fight skeletons.

Fig. 8.9: Revolving word column puzzle.

2. The Task

In order to go through two different areas, so that you could rescue the elemental Hydrogen, you had two open two doors that were activated by solving two different word puzzles.

Each puzzle consisted of three columns, each with 4 element names. On the floor was a clue on how to solve them. The aim was to make a word from the combination of three symbols of the elements. The first clue was *"My combination spells a place where you can reside"*, which was HOUSE. The second word puzzle's clue was, *"You need this to make garments with",* which was CLOTH

A book was also available out of the game as well as in game.

3. The Reward

The reward was the completion of the quest and saving the elemental Hydrogen. Ideally one would return to the Arch-Mage to obtain a reward, but the prototype was stopped as soon as you rescued Hydrogen

8.6 Design considerations

As well as ensuring that sound educational pedagogy is considered, there were some elements that needed to be included such aspects as AI

Though the Oblivion engine has some weaknesses, it also includes strengths that other games in that genre do not have. The original game itself does not allow you to climb ladders; it goes to a cut-scene for this. It does not allow you to break most world objects as some games do, in order to obtain items. However, what it does do in terms of interactivity, it does well through its Radiant AI; it allows you to sit, talk to NPCs. It enables you to add as much acknowledgement as you want from NPCs; even if it is that they look at you as you pass them by. Mass Effects, on the other hand has little acknowledgment from NPCs; once you have spoken to them and the quest is over, there are no more acknowledgements from most NPCs. This feeling of being acknowledged by the world is what makes the RPG genre an immersive experience. In some games objects are movable, though this is a weakness in the Oblivion engine; it makes up for it in other ways. This aspect of interactivity especially player acknowledgement was covered in Chapter 4, Section 4.8.4.

Non-Player Characters and Interactions.

It is important in this genre of game that the Non Player Character (NPC) is not just standing around. They are therefore given “jobs”; this can be anything from Sleeping, Doing a Task, Eating or Accompanying the Player. This adds to the sense of immersion and though time consuming to design and develop, it is necessary. If the NPC is essential to start a Quest for example, the NPC needs to find the Player, thus abandoning all his other AI actions.

A sample of AI actions for an NPC is shown in Tables 8.1, Table 8.2 and Figure 8.10. In order to design the various interactions a state transition table was initially used and then transferred to a state transition diagram; this aided the development process

Guard like NPC were used at the port in the final prototype but had also been used in the first prototype, where the guards supplied various information and directions of the world to the player

STATE	TRANSITIONS					
	Patrol time ON SHIFT	Meal time ON SHIFT	Bed time ON SHIFT	Meal time NO SHIFT	Bed time NO SHIFT	Doing nothing
PATROL	PATROL	PATROL	PATROL	EAT/DRINK	SLEEP	WANDER
EAT/DRINK	PATROL	PATROL	PATROL	EAT/DRINK		
SLEEP	PATROL	PATROL	PATROL		SLEEP	
WANDER	PATROL	PATROL	PATROL			WANDER

Table 8.1: State Transition Table for NPC guards

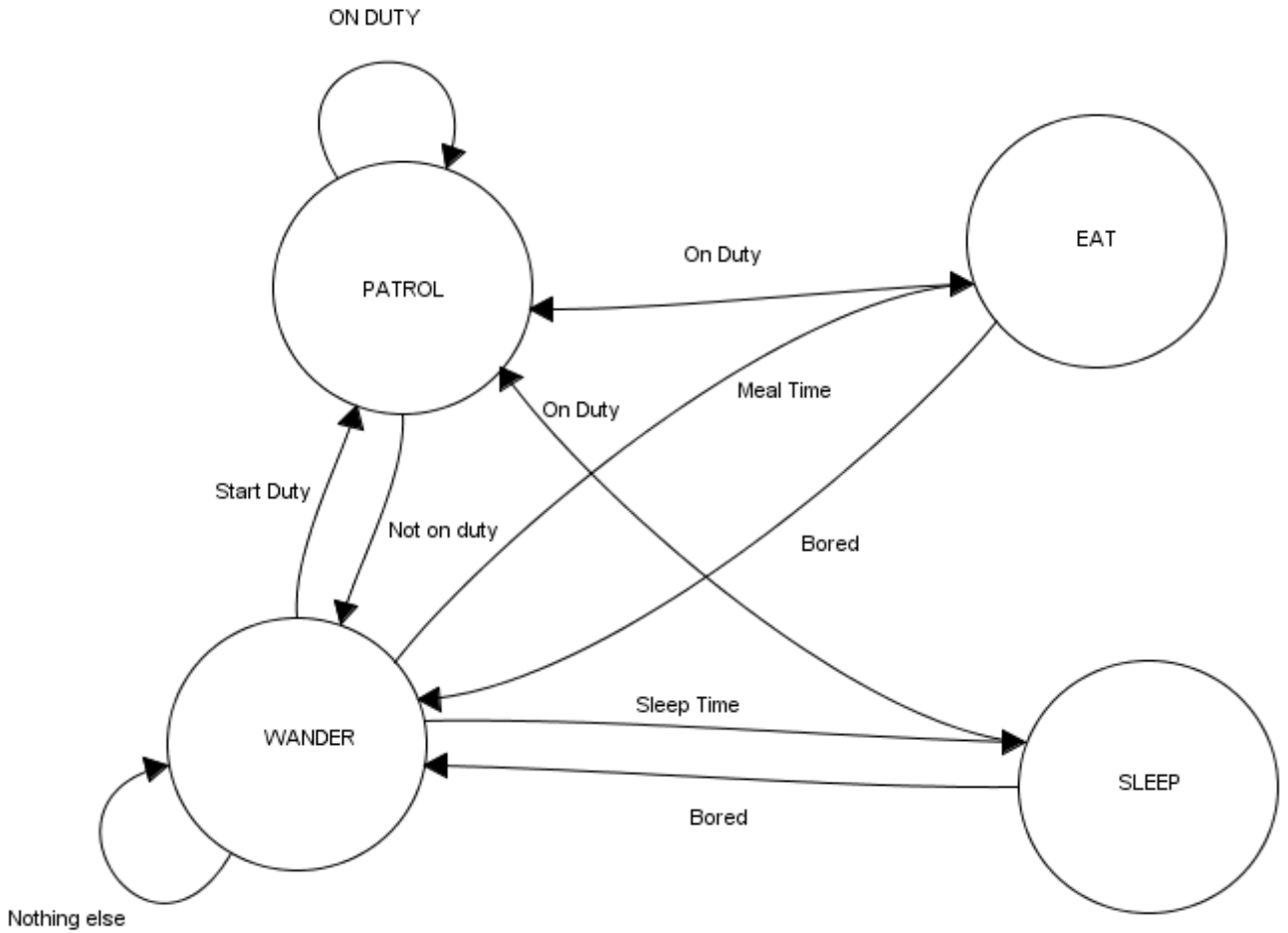


Fig. 8.10: State Transition Diagram for guards

Quest NPC that need to accompany/follow

This type of AI was used on the NPC Belroth who needed to be around when the quest started, manaing he abandonned his normal duties when the player first found him. If he lost sight of the player his AI package meant he had wait. He only started his AI package of eating and sleeping

STATE	TRANSITIONS						
	In party	In party Meal time	In party Bed time	In party Doing nothing	Out of party	Out of party Meal time	Out of party Bed time
WANDER	-	-	-	WANDER	WANDER	EAT/DRINK	SLEEP
FIND	-	-	-	-	FIND	FIND	FIND
FOLLOW	FOLLOW	FOLLOW	FOLLOW	WANDER /IDLE	WANDER	WANDER	WANDER
WORK	-	-			WORK		
EAT/DRINK	-	-			WANDER	EAT/DRINK	SLEEP
READ	-	-		READ	READ		
SLEEP	-	-			WANDER		

Table 8.2: State Transition Table for NPCs in quests

This was used to a greater extend for Brother Duncan, for Puzzle02: Placing plaques on the Paintings. When the quest is initiated, he stays seated and reads a book, as soon as you tell him you have finished, he gets another AI package that maeans he walks about looks around at the paintings, does ponder poses at various locations and comes to you to you to tell you the verdict. If you got it right he delivers his next dialogue and comes out of the above AI package. If on the other hand you did not get it right, the above AI package continues until the quest is complete. He can then wander off to bed or eat depending on the time and package.

I found the above table and state transition digrams, invaluable in the design and development phase in order to ensure that the NPC were interactive with the player and their surroundings.

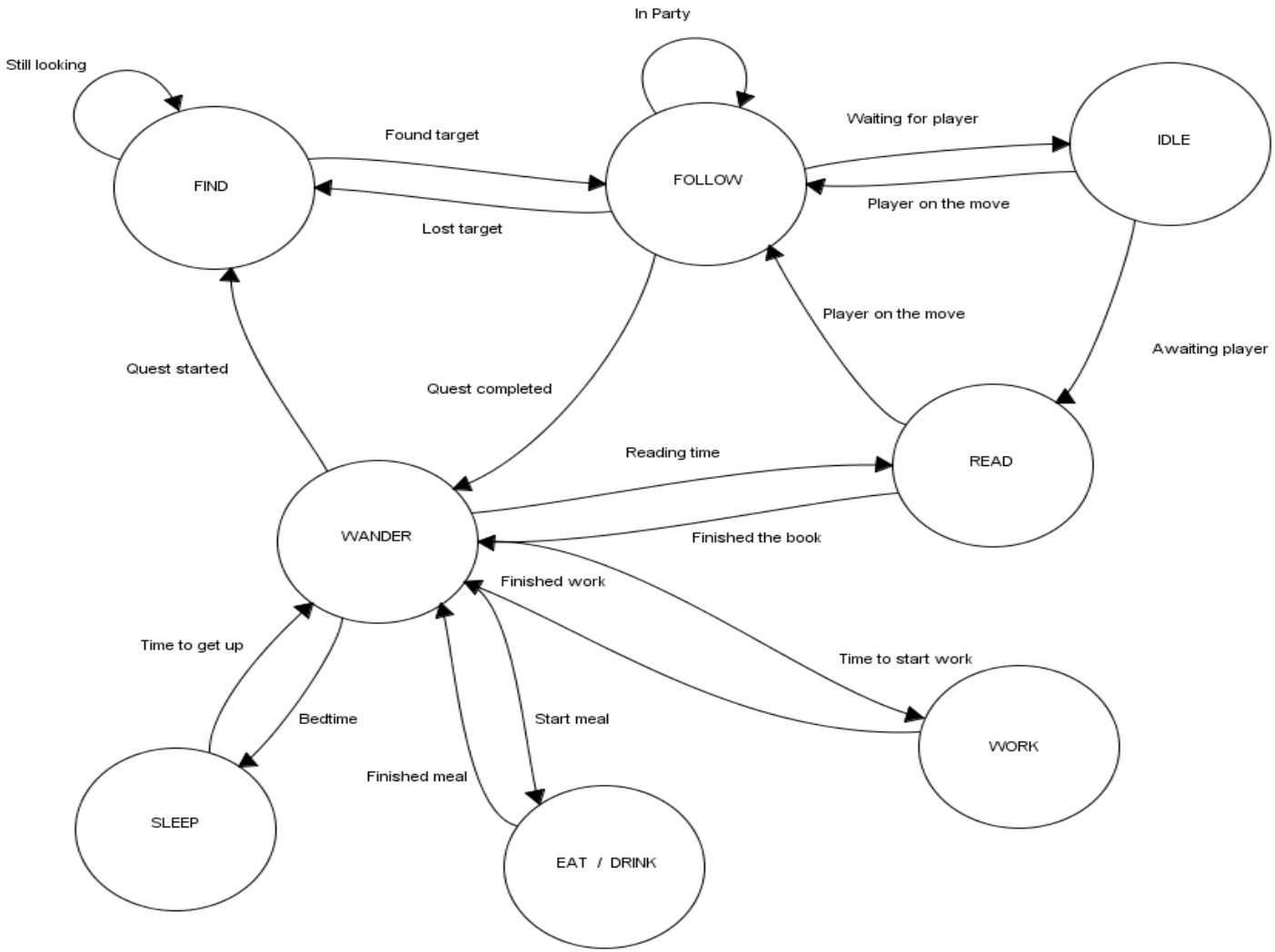


Fig. 8.11: State Transition Diagram for NPCs in quests

Adding emotion to NPC

In order to ascertain believable (or as believable as possible), facial expression were incorporated from the Radiant AI for NPC who were in conversation or in dialogue, this was also supplemented with the use of idle animations.

Skills and Factions

Jantke and Hume (2015) suggest using the skills and attributes to ensure that players develop the required skills, this was thought of for Oblivion (though you cannot change the skills' names, but it could be done through the code to give extra skills). But the concept is the same, this is one reason RPG players play RPG, to enhance and advance their character. The possibilities here are endless. The aim had been to have different factions (which it did, you can add new factions and races) and the joining of different types of guilds for instance there was a teachers guild and a science guild, there were also Dudley elves. This progression could then be determined through various quests that the players does and receives rewards and advancement throughout the game. Oblivion itself has 8 attributes and 21 skills. Though adding skills is not a feature enabled in the editor, there are modifications that enable you to add new skills. Another way to add additional skills would be to hard code it to each allocated task which could also incorporate level of difficulty and any additional requirements. This feature was not explored as either solution would have meant players having to play for several hours to benefit from such an addition, which in turn would have meant extending the game and adding more quests. However, it is useful to know that these elements are available for future use and would be a welcome addition for exploring specific designed skills that a player can achieve.

This game was used as a basis for a Phenomenography study, which is covered in the next chapter.

8.7 Summary

This chapter covered the design and development of Weogorna Civitas. During the life of the study, 3 prototypes were designed and developed. Each phase of the study led to the next phase and each phase informed each prototype. The final prototype was then evaluated in the Phenomenographical study which is covered in the next chapter.
It was important to ensure that the design of the final prototype encapsulated all the characteristics of games as well as educational pedagogy.

The game was a near total conversion. Though the worlds were created from scratch, most of the assets were from the game or from the modding community. However, the puzzles, some extra textures and graphics were also designed and developed specifically for the game. The engine used was The Elder Scrolls Oblivion IV: Oblivion engine.
A basic Prototype1 was used as a basis to inform the participants of the capabilities and functionalities of an RPG, especially in relation to an Educational Serious Game. A collaborative design was the product of prototype2.
The studies and research then enabled the final prototype3 of Weogorna Civitas: Khemia. A game set in the province of Khemia that introduced puzzles related to Chemistry and Scientists.
This final prototype was then used in the phase3 of the study in a Phenomenographical study, covered in Chapter 9.

Part VI: Phase 3 Evaluation

It's sort of a mental attitude about critical thinking and curiosity. It's about mindset of looking at the world in a playful and curious and creative way. (Adam Savage)

9 EVALUATION

This study aims to explore how video games could be designed and developed for education that could fulfil the needs and expectation of both Students and Educators. It evaluates the concept of whether the artefact was viewed as a game or a learning tool, as well as the general views and experiences.

This part of the research aims to ascertain the views and experiences of educators and students in a Phenomenography study of phase 3 as described in Chapter 5, Section 5.5. The study uses the final prototype3 game that was designed and developed, as described in Chapter 8, section 8.4.

It is important to remember that it is not focused directly at the artefact but at the variation of people's perception of understanding and experiencing it (Larsson, 2007).

Research has shown that gamers are motivated and engaged when playing a game, however the design and development of educational games often misses the mark in capturing the essence of what actually motivates and engages the player. The studies overall have either concentrated on the content and pedagogy from the educational perspective or on players from the game design perspective.

This study aims to understand the gap between the educators' needs and students' expectations and ascertain if it is possible to design and develop an educational game that meets both parties. It also aims to ascertain players' perception and experiences of playing a RPG with a view to finding the types of

players, in order to see if this has a bearing on designing an educational RPG and any lessons to be learnt from it.

The analysis attempts to follow the Larsson et al way of looking at the study. Most of the studies conducted have concentrated on the learning. In their seminal work on *"Four ways of understanding the anaesthetist's work"*, Larsson et al have expanded the use of this method to those who wish to go beyond the realms of ascertaining learning and how people learn. Another study in a similar field to this thesis is that of Whitton, (2007) who used Phenomenography in her own thesis though she considered it as mini-phenomenography as there were only 12 participants; her study was to ascertain the characteristics of games.

Participants were chosen primarily as gamers, non- gamers, students and educators.

Amongst educators, there was a difficulty in finding gamers and only one could be considered as a gamer and though in education, was not a qualified teacher.

Participant details are included in Table 9.1

Educators came from:

- University (3)
- Secondary School (1)
- College (1)
- Primary (1)

The games design lecturer who was due to participate was unable to do so because of long term illness. They had however helped with the collaborative design of the initial prototype. Gamers that were chosen were a mixture; students or recently graduating students or those who were just gamers.

Gamer participants had a wide range of ages, capabilities and areas of expertise. Some of the mature participants were also parents.

Participants were given the choice to play by themselves, with others or just observe and play certain elements. All participants attempted to play the game apart from one, who observed a game being played; they ended up acting as mentor to a student who struggled with trying to form a word from the clues of a puzzle. This was important because some were non gamers and the aim was to see their perception. Some people played half the game with an observer and then they swapped roles, whilst others did play the whole game. Everyone

who participated experienced between 30 and 90 minutes of game playing time. They all had access to a chemistry book called '30-seconds Elements'. When they had finished playing they were interviewed and the conversations digitally recorded.

Questions that were asked:

What did you experience/think of the educational game?

What would you think if the game only had the puzzles in the rooms and nothing else?

9.1 Participants

Participant	Age Range	Gender	Gamer/Non-gamer	Educationalist/Non-Educationalist
A	>35 (RG)	M	Y	NE
B	<25 (RG)	M	Y	NE
C	<25 (RG)	M	Y	NE
D	<25 (RG)	M	Y	NE
E	<18 (Y10)	M	Y	NE
F	<18 (Y10)	M	Y	NE
G	>25	M	Y	NE
H	>25	M	Y	E
I	<18 (Y11)	M	Y	NE
J	<25 (RG)	M	CG	NE
K	>35	F	N	E
L	>45	F	N	E
M	>45	M	Y	NE
N	>50	F	N	E
O	>50	M	Y	NE
P	>35	M	N	E
Q	>40	M	Y	NE
R*	>40	M	Y	NE
S**	>25	F	N	E

Table 9.1: Participant details.

*R played and was only observed, so has been included in observation section only.
**One other female educationalist did play (S) but only as team player with (R) and not on their own, but unfortunately due to time constraint was unable to be interviewed and therefore has not been included at all in findings.

There were originally 20 players but one was unable to proceed (female, educator), on the day due to ill health and the session was terminated.
The categories have been built from the 17 that were interviewed, though extra observational details include participant R (18)
It is considered sufficient to have 15-20 participants for this type of study, however a number smaller than this would be considered acceptable as long as the variance of experience is found (Bruce, 2004). Having more than 20 becomes logistically difficult to manage.

9.2 Observation of gameplay and participants

It was felt important to also observe the participants and though this part was not included in the categories of description, it aids in the depth of the study, giving it another dimension.
Most talked to each other and tried to help each other and nearly everyone with the exception of two looked at the book. A lot of the participants had to be nudged into using the book when they got stuck (even though they were initially advised that the book was available to them) or told to find the existing clues in the game (even the hard gamers (Participants H and I) did not think of always looking for the clues).
Participant E took 90 minutes and went to nearly every part of the game, ensuring he did not miss any salient points. He needed help with the floor puzzle but did with a little help work out the Metalloids using the real book.
Participants F and G, a father and son played some of it together. Playing together also took them 90 minutes. Participant Q started but he only got as far

as the Metalloid floor puzzle and we had to end session to restart another day. He made a point of saying that he expected that the clues to solve the Metalloids should be in the game only. Participant R who considered himself a hard core gamer, jumped each time he saw a skeleton or a spider. He also found the controls difficult to master as he was used to an Xbox controller. He kept pressing the wrong buttons and eventually ended up attacking an NPC which resulting in him having to restart the game. The NPCs were given AI in that they would respond only to repeated attacks against them, however they could not be killed, which was to stop students trying to kill off potential mentors in the game.

One Participant (D) hacked / cheated their way through to get to the dungeon without getting the key and consequently could not proceed as the quest stage had not gone forward.

Participant H did not go through the designated path to the village and consequently the marker was not flagged to true, and though they proceeded with the quest, they made it hard for themselves by having to find the NPC who would provide them with the quest clue.

Though neither of these two incidents made much difference as there were other methods of triggering the stages, it is something that requires consideration in the future game design.

One Participant (N) did not like the dungeons, feeling they were claustrophobic, they did not like the skeletons, and in reality this participant did not like much of this game apart from the horse.

The first session had a crash of the system and the Participant (B) was unable to continue; they did continue from a previous save point that had been made as a failsafe.

Another Participant (C) managed to crash the game towards the end and did not complete it (it had not been saved); they did however ask after the sessions were complete if they could have a look at the way the game was designed through the editor and spent some time looking at it.

(The issue of ensuring that the system was more stable was rectified after the first session of 5 participants)

There were no crashes after this time. The crashes happened to experienced gamers and they seemed philosophical about it. The original Oblivion was

prone to crashes; however this would not be acceptable in an educational setting.

Participant D changed all the controls to suit them and this had to be re configured to ensure that others could follow the in-game book that gave them the control settings.

One participant looked at the map and ignored the roads and went through the shortest possible route to get to where they needed to; this meant they missed a lot of the extra elements.

9.3 Results and Analysis

Once the participants had played the game; as previously mentioned this could be separate or with another, they were each interviewed. The interviews were then transcribed verbatim and the task of analysing the data begun.

It is important to note that though the themes and categories were defined following strict rules, the outcome space and the naming of categories becomes by its very nature a subjective process; no two researchers would come up with the same descriptive names. It aims to show how people experience the same phenomenon in different qualitative ways.

9.3.1 Categories of Description

Categories of description are the collective conceptions (Yates et al, 2012).

The category of description names were partly chosen to pay homage to the RPG genre and to describe the whole process of emotion and experience. It was felt that the analogy of a tourist best described all participants in the beginning of their journey. Descriptive names such as the Novitiate, the Journeyman, The Pilgrim, The Scholar and The Explorer are often found in RPG genres.

The following were used as metaphors to categorize the various experiences in the categories of descriptions:

- The tourist: here the main focus lay in the initial perceptions of the world that they entered.
- The novitiate where the main focus was that of the tourist understanding the rules and objectives of their environment and how to get around the world.
- The journeyman where the main focus lay in the growth of the player in mastering their environment and gaining the experience towards a more seasoned traveller.
- The pilgrim's main focus was the way the world was perceived.
- The explorer considered the aspect of the interaction with the environment.
- The scholar considered the way new experiences and knowledge were approached and their application.

Though it is common for the categories of description to be as few as possible, three of the categories were broken down further to show the opposing views. This is not only important to ensure validity but also on reflection seems to align with the view that people experience things on a continuum and showing both sides of this spectrum was important and invaluable. The result of Category of Description could have ended with Pilgrim, Explorer and Scholar but would not have shown the variance or depth. These initial descriptions such as Pilgrim, Explorer, and Scholar could be considered to be in the middle of the continuum.

(a) The tourist

The tourist category is the first and initial experience of the participants. Here they come with pre-conceived ideas, previous experiences and expectations of their surroundings. Just as a tourist, they can either have visited a similar environment or be a completely new traveller; but they all have some form of expectation, though not all of them may state their view.

In Focus: The Serious Game where the participants come with their baggage and expectations or preconceptions of their expected surrounding and experiences.

Participant A: *"I loved the scenery, hmm the…it took me a while when I started to play in the game, it kind of draw me back to the times when I played, I used to play games and I and I… it struck me that you know, wow, this is why I… this is why (cough) I like…. loved playing games."*

Participant C: *"I didn't feel I was getting tired from the game too easily; it seemed to sort of immerse me, longer than a game normally does".*

Participant D*: "Well, I have played Oblivion before, so I had some expectations of how it would work, and there was nothing unexpected in the mod really. Yes, it was a good experience."*

Participant E: *"Well I thought, I never really, looked at it as an educational game but my first initial ideas before I played the game was it was going to be you've got to put in letters and numbers and stuff but is not it's more of a just Oblivion with more of an educational puzzle"*

Participant K: *"I'm not a gamer…. I think it's quite addictive actually, because you don't know what to expect, you know"*

Participant N: *"It seems huge. (Laughs) Seems like big world."*

Participant O: *"It probably helped that having played Oblivion; the whole thing had a familiar feel to it…… I think it's that familiarity with that world environment that makes it easy to get immersed in it."*

It can be seen that the tourist had varying expectations and different varying experiences. Some felt nostalgic, some had no idea what to expect, some did, whilst others were surprised, either that they enjoyed the experience or that was not what they expected.

(b) The novitiate

The novitiate category is the experience of a new tourist; either needing to familiarise with the rules, objectives or culture of their surrounding or having to deal with unexpected scenarios.

In Focus: The new tourist finds their way around the culture and learns to deal with unexpected happenings. This is also about learning the rules and objectives.

Participant B: *"A good experience, though I would say I got lost a few times from places to places."*

Participant C: *"The general concept of the quest looked very well designed, and I actually enjoyed looking through the quest, it's a shame that it couldn't have started and finished…"*
Q: *"So, in spite of crashes, you thought that was useful?"*
Participant C: *"Yes, I thought it was useful. I would play it."*

Participant F: *"I think it would really work it just needs a bit more you know to bulk it up a bit perhaps a few more tips and clues on where to go."*

Participant I: *"Yeah, I found the game interesting. Obviously it did have very minor bugs in it which I'm sure as it is only a prototype can be fixed. But if you were to fix them, I think it can become very successful."*

Participant J: *"I think it took quite a long time to do things. It was a little bit frustrating not knowing where to go"*

Participant J: *"Yes for instance I kept punching stuff, it wasn't that I kept punching stuff, it was that I was trying to click on stuff. For instance I thought space bar would be to jump stuff not kick me off the horse, it's just things like that."*

Participant K: *"When I first sat down to play it, I thought, I haven't got a clue I don't how to do it. I don't know what I'm doing, I don't know what I'm trying to solve. But just knowing those few controls to start with, starts you off and gets you into the game. ….you sort of know what you have to do because I had a little bit of guidance, didn't I? About press this, press that, go and find this, go and talk to that person."*

Participant N: *"I'm sorry because I don't play games, but I've watched a lot of people play them so… (Long pause) I don't know, again I enjoyed the outside*

bit, I really enjoyed being on the horses. (Laughs) That's because I have a background with horses, and I like the animals, and I like the outside."

Participant O: *"The only problem I had was that I'm more of a console player, so using PC commands I found a bit hard going."*

One of the main issues was the PC controls, a lot of the participants were Xbox or Console players and though there were instructions within the game, some found it frustrating. The minor bugs and crashes suffered in the first tests were a problem but seemed to be handled with humour and patience; these were gamers and seemed to accept the fact that prototypes would have some issues. The issue of getting lost was mentioned, some found it challenging, and others felt that they needed more guidance. The original prototype did have a tutorial session for players, this was bypassed due to time constraints, and in hindsight it might have been useful to keep it in.

(c) The journeyman

The Journeyman comes to the fore for those who either have previous experience of similar surrounding (in this instance used to playing RPG) or those who have progressed in terms of understanding how to manipulate the world around them and interact with the natives of this environment; be it the controls or the world around them.

The Journeyman also has another characteristic, they will either follow a typical tourist mentality in their expectation (in the sense that they expect all the answers to be internal to their environment) or be open to new experiences of viewing their environment outside of the tourist trail (they are happy to ignore the accepted travel guide and seek information from other sources to maximise their experience)

In Focus: The more seasoned traveller either gaining the experience or having more experience to continue.

Participant A: *"It takes some time to get into the world but, but once you're in there hmm it's hmm you know it's hmm it's highly engaging…"*

Participant B: *"It didn't bother me, well laid out, good, nice easy to follow for the most part, the markers were pretty well so you could tell where you had to go totally easy. If you rode past somewhere you missed you could see the markers, you could find it pretty easily."*

Participant E: *"In a way you could have added an easier way to get to your place and easier way to mark it down because I noticed that I had to keep scrolling to the thing to look at it. But… In educational standards it was good and if definitely made, I'd play it."*

Participant H: "*Yes and it took me a while just to find the clue scroll, lying on the floor as to what you actually had to do, would have helped if I had found that first, and then of course what are metalloids and you think maybe they are something in the game, and you start wandering around looking for a scroll or something with hints on it, and I couldn't find it, so yes that was challenging certainly."*

Participant k: *"As I started to play it, I thought ooh this is exciting. I don't know where I have to go, I don't know what I have to do but I know I've got to do something."*

Participant K: *"And I went oh okay, because I wanted to go somewhere else then and do another one"*
Q: *"So you wanted to carry on?"*
Participant K: *"Yeah, and considering I'm not a gamer then it did…it was exciting."*

Participant N: *"I like the music, but after a while it gets…I find it hard to concentrate with music, and I'm not much of a multi-tasker, so I would probably have to turn the music off if I really wanted to concentrate and learn, learn what was going on, because I just find it distracting, but that's me, I find music in the background distracting."*

Participant N: *"I definitely did feel immersed. Not completely obviously. I know I'm on a screen, but I felt more in a mood than immersion, I'm more engaged but to break the story by putting a physical copy of a book next to me, for me that's, just didn't fit, somehow I wanted to stay in the world."*

Participant Q: *"The environment/game should have all the clues. "*

Participant O: *"I liked the fact that I could get more information from the 'real' book. What's the term when you find one bit of information and then go looking for other things relating to it?"*
Q: *"Tangential Learning?"*

Participant O: *"Yes, that's it, tangential learning. Having a book within the game is ok, but there is a limit to the amount of information you can get from it. I like the idea of a game that encourages you to seek out further knowledge and information on a subject."*

The Journeyman opens up three other categories which describe the different ways they experience the phenomena; the Pilgrim, the Explorer and the Scholar.

It was found that each category of Pilgrim, Explorer and Scholar had distinct opposing emotions on the continuum and it was felt important to show these; therefore, each of these are split along the continuum. As seen in section 5.6.1 that characteristics of personality such as those found in the big 5 (FFM), and Kort's affective emotions, show that emotions are not as Adams (2014) so eloquently states binary; they are not one or the other but on a continuum. More importantly, our moods change as does our motivation.

(d) The pilgrim

The Pilgrim category is the way the participants view the whole experience and is directly related to the whole phenomena.

In Focus: The way of looking at the phenomena.

Participant A: *"No, no initially I didn't, hmm. When we, when you came in, into this room with the periodic table hmm it took me a while to, to see that and to understand that this is, vow you know, its hmm, so it felt more as if I was playing a game and less and less about periodic table."*

Participant B: *"Easy to use, aesthetically pleasing I suppose one could say."*

Participant C: *"If you have game design principles essentially people are going to be more willing to learn without realising they are actually learning, and it's actually a game rather than an educational tool."*

Participant D: *"It was quite fun actually. I've never really tried an educational game, with like a real sophisticated game engine like Oblivion."*

Q: *"Have you played any educational games?"*
Participant E: *"Yes some but not like that the ones I've played you had to type loads of stuff in…….*
I rate that as probably the best of the educational games I have played because there are two branches to it it's an educational game and it sticks to the standard RPG."

Participant G: *"No it was actually quite impressive, I wasn't expecting something quite that polished."*

Participant H: *"Oh yes, that's the thing, it has such isolated incidents, as a proper set, you do the puzzle and then you go wander off for a long, long time, seemingly not doing much of anything, and not necessarily game elements… so like you wander along, but normally in a game you might have thieves or something, some such side quest interaction, which wasn't in there."*
Q: *"An educational tool, or an educational game?"*
Participant H: *"More of an educational game I think. Because you have got your puzzles and things if you like, those could be tools, but for the fact everything is linked up in one cohesive world, and there's stuff to do outside of that, as well as the puzzles."*

Participant L: *"I think that the learning was evident and that the hum the exploration was evident hum, but it was masked quite heavily by the game."*
Q: *"Would you consider that a learning tool or a game, still?"*
Participant L: *"A game."*

Participant M: *"Hum, I felt it was more, it felt like a game to be honest."*

Participant N: *"Probably more as a game because it took quite a while, there was a lot of exploration to get to the actual learning bits of it."*

Participant O: *"I think there was a nice balance between the two. I think it's very difficult to fit everything into what is in effect a prototype stroke demo. I felt there were enough gaming elements to engage people, allied with interesting and challenging puzzles to give it the educational content."*

Participant F: *"I like the concept I think it's good but I don't think it would work for people who are non-gamers because they might not get the drift and like veer off and get bored with it and as a tool to encourage people to do work and learn I think it would really work it just needs a bit more you know to bulk it up a bit perhaps a few more tips and clues on where to go."*

This was in relation to whether they viewed the phenomena as a learning tool or as a game

The Pilgrim has two main ways of viewing their experiences; the conservative and the liberal.

(d1) The conservative

A conservative tourist is one who has pre-conceived ideas and expectations and expects the experience to meet and match that expectation. They both share a common theme, the instructional designer/educationalist who believes that it should be first and foremost a learning tool and the hard-core gamer who believes that the phenomena should be a game and only a game; they are both fixed in their beliefs.

In Focus: Old school, traditionalist. Expects instructional tool or game.

Participant H: *(in respect to more fighting and side quests)"…but normally in a game you might have thieves or something, some such side quest interaction, which wasn't in there."*
Q: "*…you can't have fighting on the road, not unless they're skeletons."*
Participant H*: "What about the wildlife. Like mountain cats and things?"*
Q: *"No."*
Participant H: *"Well that takes a lot of the game out of it."*

Participant N: *"Well that's good, but still feels the same, for me it just doesn't feel right, you know slicing up rats. But again I suppose there is that balance to strike with engaging children, but I don't think it's right, it's just me, it's my preference.*
I think students need to be guided, even if they prefer to have lots of fighting, that doesn't make it right, you know what I mean? "

The above felt strongly one way or the other, in the sense they felt it should be more instructional whilst on the other side it was felt there should be more elements of gameplay

Q: *"What would you think if the game only had the puzzles in the rooms and nothing else? This related to the removal of game elements and leaving just the puzzles."*

Participant J: *"I would be happy to jump from puzzle to puzzle."*

Participant P felt that both could be accommodated but felt that the puzzles would be more useful in class activity. In order to explore this, further discussions were held on these points, in section 9..3.3

(d2) The liberal

The liberal tourist however is more receptive to new experiences.

In Focus: Receptive at new ways of doing and looking at SG.

Participant C: *"I didn't really feel like I was doing anything majorly educational, it just felt like it was a challenge to do the puzzle, and I just wanted to kind of accomplish that challenge really more than anything else, but I appreciated the learning value I was getting from this."*

Participant C: *"There were quite a few learning tool principles, and it was very well done in terms of a sense of how the game play design enhanced learning which is what in my opinion educational establishments should be going more towards, they should be going more towards educational fun games, rather than just educational games that aren't really well designed."*

Participant D: *"Well first I wasn't told what it was, so I had no idea that it was an educational game, I probably wouldn't have figured it out until quite some time. Also it was quite well hidden."*

Participant E: *"What I observed with your game that you've changed a lot of it to the point that people will play it and also learn an educational value from it but they'll like to play it anyway because it comes off an RPG."*

Participant M: *"Yeah, cause its… if you play games it's what you do basically, you go around and you investigate things, you know, you find out what's in a room, whether you need anything. It's more like, yeah, it makes it more like a game."*

Participant K: *"No, no, no, the travelling is part of it. The going outside and the travelling is part of it. It, it makes you feel more absorbed, I think, whereas if you were just in the room… no."*

Participant K: *"I don't think I would like that because, because you're sort of transported into it so if you were…. So if I was doing that and I was in a room all the time, I think it would make me feel quite claustrophobic actually."*
In relation to: **What would you think if the game only had the puzzles in the rooms and nothing else?** This related to the removal of game elements and leaving just the puzzles

Participant D: *"No, it wouldn't have been that interesting. No. It's the open world element, and the role playing that you get immersed in the game, makes you want to accomplish the quest."*

Participant G: *"No I don't think that would work as well. I think there probably is a sweet spot between the two but I think you would probably lose the gaming element. I think the thing with those games is that they are open, there's the element of freedom, you can walk wherever you like and I think if you force someone down a very narrow path it wouldn't feel quite as like it was their choice. I know that about just making people feel."*

Participant F: *"No because it would just be like any other game that the teachers give you to play. It would just be puzzle, puzzle, puzzle there would be no exploring or actual game features it would be just like that that that."*

Participant H: "*No, it's not a game. (Laughs). For me, a game has got to link up. So if you have got an isolated set of puzzles, it's an isolated set of puzzles, it's not a game. There has to be some sort of cohesive thing or element that contains everything."*

Participant I: *"I think that would completely destroy it because, the reason, the reason why people game is because of the puzzles, they're intrigued with them, that's why they stick to the game and the way you've mixed the education and the puzzle together is very good but if they were to take out the puzzle then it would just become educational, reading off the screen which I think wouldn't be as… Because you are taking away a huge aspect which makes a game a game. You can't just have consistent puzzles."*

Participant K: *"No I completely disagree with that because, because you do a puzzle, and then if you are going to, if you need to go somewhere else, it sort of almost gives your brain a break and it's almost like chunking that material."*

Q: *"That's a good way of putting it."*
Participant K: *"Because if you just go from one to another, then you're going to think oh, humph, another one and I think that would probably be a de-motivator and you would be fed up quite easily. Whereas, having that break and going to travel somewhere else, then, then I think that keeps the interest. Yeah, I think the chunking of doing that is much better. So I would disagree with that."*

Participant M: *"Hmm, I think then it would feel more like (Laughs), a just an educational tool rather than a game and because you can go and investigate other things, that may not be you know, part of the puzzle or whatever, it makes it feel more like a game really. You know it's more immersive."*

Participant O: *"I don't think that would work. It would no longer be a game. An RPG is all about the sense of immersion you get, about the story, about the characters and how your actions affect the outcome within the narrative. You complete quests and puzzles to progress within the game. If I only want to do puzzles then I can just get a puzzle book, or watch things like Only Connect on BBC2."*

(e) The explorer

The Explorer category is the way the participants interacted with their environment and the world.

In Focus: The interaction of the world.

Participant A:" *The journey, yes. The complete experience of being in a world with everything that entails. The music and the visuals and the things you can do."*

Participant E: *"I like to look around and enjoy what the makers have put into the game rather than most people who aren't very used to RPG and more of an FPS they like to go straight for the objects and don't like to observe what the developers have added it."*

Participant J: *"Actually I did notice the weather, looked up at the sky and thought it was quite nice… Yes and the buildings and those trees that hovered, it was quite interesting."*

Participant K: "*Hmm, so I think that's, that's the exciting bit, you don't, because you're not on the straight pathway, it's that air of discovery."*

Participant M: *"From what I played of it, there is a lot to investigate and to look at. Hmm, hmm and yeah it draws you in, it's a good game."*

The Explorer is also split into two main ways of viewing the world; the curious and the reluctant.

(e1) The curious

The curious explorers were the participants who approached the world with a curious and enquiring mind.

In Focus: Interacts with curiosity and enquiring mind. Interested in the experience.

Participant A: *"It takes some time to get into the world but, but once you're in there hmm it's hmm you know it's hmm it's highly engaging, it's highly engaging being, being in the, in the world and just exploring, exploring and you want to know everything."*

Participant K: *"Okay. Hmm… As I was moving through it, hmm, because things sort of pop up as you go along. It makes you stop and think, do I need to go there? What's that building? Should I be looking at that? Do I need to go up that pathway, which way is the pathway taking me?"*
"Is that my objective? It sort of leads you through but it's asking you questions all the time. Isn't it? That's what I thought it was doing. Even though you can go to the map and you can say, right, I'm still on this path, I'm going South West, but are these other buildings important? Should I be looking to see what they are doing? Is it part of the puzzle?"

Participant L: *"But it is an enhancement to and sparking curiosity and creativity in students to actually go and explore a bit further. It may get people to go and think, oh, I wonder what that is, I've never heard of that before and go outside of the game and go into a book. And that's what flip learning is, it's about sparking curiosity, sparking engagement, sparking hmm, knowledge… quest for knowledge."*

(e2) The Reluctant

The reluctant either had no real interest in their environment or sped through the world in order to finish the game.

In Focus: Interacts with minimum interest in the surrounding. Listless, reluctant or a speedster in order to finish.

Participant H: *"Well part of that is because I'd played Oblivion extensively before, so I'm quite familiar with what sort of things there are in that game world." (Observation: didn't look round)*
Q: *"Was that because your assumption was, it's just going to be like Oblivion?"*
Participant H: *"Yes, pretty much."*

Participant J: *"There was a lot of reading that had to be done, just to get from place to place, so I had to get a horse. Instead of going straight to get a horse, I had to go to a person who then took me to their house and I had to get the horse, then I had to go to the University."*

Participant J: *"I would be happy to jump from puzzle to puzzle."*

Participant J: *"It was interesting to a point, where you had a break in between doing things. It took a while to go to different places, so you weren't constantly solving puzzles. But to me it still did not make sense, you had to spend a lot of time getting to places."*

Participant J: *"The trouble is I think, okay, logically I have to go here and get this. I know what I need to achieve but if I try and do that on my own, I'll skip a few steps that might be important for later on. So I'm constantly thinking, I can't just enjoy it and get immersed and go somewhere because I have to make sure I go to the right places first and talk to the right people and get the right stuff and do the right actions and sometimes if that is not obvious, it does not immerse me."*

(f) The scholar

The Scholar category is the way the participants experience and approach new things, mainly concerned with knowledge and their application of it.

In Focus: The way they approach new things and knowledge and their application.

Participant B: *"That's the thing, the puzzles, they forced you to learn, but it didn't do it in a way that you hated it if that makes any sense."*

Participant C: *"I though the puzzles were very well designed, in the sense of they were very challenging, and they made you think outside the box, and the learning made from the puzzles I thought immediately was you felt like you were going to learn the elements, you felt like you had to work out the kind of elements you needed, you felt like you were applying visual and sort of kinaesthetic learning, which then would make you learn the elements much better."*

Participant E: *"In an educational way it is good it tells you a lot about chemistry you have to it challenges you in a scientific ways. Yeah I think if people played this, it would be more of an educational value to them it would boost their skill in science and mathematics and English 'cos I notice that most of the game was converted into modern day English than what it was originally."*

Participant G: *"I think it would be excellent because it would be definitely calling on their knowledge and they would have to use it so yeah I thought it was really good."*

Participant L: *"I thought it was very interesting. I thought that it was engaging, hum and I thought that the elements around the actual components of learning would be enough to distract people from thinking that were actually doing anything educational at all."*

Participant M: *"I thought the game was very good, it encourages you to look up things and learn as you go along."*

Participant N: *"But I find puzzles, I'm not a puzzle person, I find puzzles frustrating, and I did as a kid too. I don't like learning that way."*
Q: *"What about the portrait one?"*
Participant N: *"Yeah, that was ok, I didn't feel as stressed, I could, I felt that was better I suppose, less frustrating."*

This category is again found in two opposing views; the seeker and the behaviourist.

In the Scholar area the types of learning that could be considered are:

Cumulative (Classical and operant conditioning from Associative learning, can be considered to fit under this domain.)

Assimilative or learning by adding to what is already known and building upon existing knowledge constructs but can also be considered a way where one gradually builds their skill or knowledge. One can also fit the new concepts into pre-existing constructs. According to Illeris (2009), in this form of learning it is often difficult to apply or transfer this knowledge to other areas.

Accommodative or transcendent learning which is where something might be difficult to understand or relate to. It may not fit into the learner's pre-existing concepts and can be a painful process requiring a lot of mental energy (Illeris, 2009). If one can 'accommodate' this new knowledge, the result of this type of learning is that the learner has really understood the concept and it can be applied or transferred to a different context. Vygotsky's Zone of Proximal Development is an example of the use of Accommodative Learning, where the challenge is set to the appropriate level; the level of what a learner could achieve with help from a teacher or more knowledgeable peer.

The Seeker showed signs of Associative learning if they were not used to this type of game or medium, then proceeded to Assimilative. There were signs of Accommodative learning, especially observed when they either helped each other especially with a more knowledgeable peer or when they received guidance from the researcher.

The behaviourist on the hand seemed to stay at Associative learning, with occasional powers to proceed to Assimilative. However one participant seemed to just want rote type and didactic type of help.

(f1) The seeker

The Seeker is a problem solver, one who seeks answers either by collaboration or working things out. They are open to the cognitive, constructive, social-constructive, discovery/ enquiry- based way of thinking.

Supposition: They don't mind the behaviourist approach at the beginning but expect to be challenged in some way.

In Focus: A problem solver, one who seeks answers either by collaboration or working things out.

Participant A: *"I thought it was fun and (gap), it created an excitement (cough) after the, after first challenge. I could…. just observe, that my excitement level increased hmm because it was, it was, it was very, it was challenging hmm, the first puzzle."*
Participant B*: "The puzzles were there, and you got to them and the first thing I did was the metal, metalloids thing, so I had to go and look it up so you could go and complete the puzzle which is probably a more useful way of doing it, because you are learning it, you learn those patterns, and then you use those patterns effectively."*

Participant H: *"I guess the thing on having more invention in some games like an RPG, you go online to find information for an RPG, so for example in Oblivion there are various types of weapons and I will go online to find out what the best weapon is, how I acquire it in a quest etc., so I will go to external sources in that way."*

Participant K: *"And so when I was doing the puzzle with the metalloids, I knew I shouldn't have stepped on the Copper, obviously, so I got that wrong. Hum, but then it was so which one is a metal and which one is a metalloid? Which ones don't I need to tread on?"*

Participant L: *"Hmm, but that's not the point, the point is someone discovering the learning and hmm the bits in between are what makes the learning more engaging."*

Participant L: *"Yes learning has taken place, the fact that it has not been assessed in the game as such, doesn't mean anything. The assessment… what I'm talking about is stick ability. Will the people remember "Oh, that's what I found when I when there", yes they will because they were engaged in it. It's the engagement that makes the learning stick. So it's the finding of the elements or whatever you're finding out, with the walk in between, the talking to the people, all that, that's all integral to actually you…it's your curiosity. It's, it's developing students' problem solving skills."*

Participant O: *"As I never really liked chemistry, yes. But not impossible. You know playing these sorts of games that there are usually clues to find, so even though I did have a real book, I guessed there would be something within the world that would help to work out the answers."*

(f2) The behaviourist

The behaviourist, on the other hand, requires and expects step by step instruction and direction. Believes only in positive reinforcement and expects no failure. The challenges have to be easy, so there is no chance of failure. They usually fall in the domain of behaviourist

In Focus: Requires and wants step by step instruction and direction. Believes only in positive reinforcement and expects no failure (or challenge).

Participant E: *"I think to improve I think there would have to be a bit more less challenging."*
Q: *"You think it too challenging?"*
Participant E: *"In ways it could be too challenging but in ways you've added stuff to get over the challenges."*

Participant N: *"I don't like penalties, so I think the one, the last one where you had to pick the metals and pull the lever and go back, and pull the lever. That kind of thing drives me crazy, but again that's just me, people might find that challenging, but for me, I would rather have, just be able to like click on one and find out if it's right more quickly."*

Participant N: *"More chances maybe, more chances to fail, to learn it, other than having to go back and pull it, like after five I'm finished. I don't know, maybe the feedback needed to be more direct, maybe, it's an idea."*

Participant N: *"Yeah, I think the user feedback in terms of the experience with the scroll, you know you say this is for people who are familiar with games, I think there's quite are a lot of assumptions about what people are going to notice if you scroll down, there needed to be something there, because I didn't necessarily know there was more information further down, without some sort of micro interaction."*

Participant N: *"Well I suppose you could also just have what a lot of sites do online, they have a product, they do a quick video, about initially to give you a quick intensive kind of thing."*

9.3.2 Outcome Space

Once the categories of description were established, the outcome space was formulated. This showed the relationship between the categories

<table>
<tr><td colspan="3">The tourist

In Focus: The Serious Game where the participants come with their baggage and expectations or preconceptions of their expected surrounding and experiences</td></tr>
<tr><td colspan="3">The novitiate

In Focus: The new tourist finds their way around the culture and learns to deal with unexpected happenings. Learning the rules and objectives.</td></tr>
<tr><td rowspan="6">The journeyman

In Focus: The more seasoned traveller either gaining the experience or having more experience to continue</td><td rowspan="2">The pilgrim

In Focus: The way of looking at the phenomena</td><td>The liberal
In Focus: Receptive at new ways of doing and looking at SG</td></tr>
<tr><td>The conservative
In Focus: Old school, traditionalist. Expects instructional tool or game</td></tr>
<tr><td rowspan="2">The explorer

In Focus: The interaction of the world</td><td>The curious
In Focus: Interacts with curiosity and enquiring mind. Interested in the experience</td></tr>
<tr><td>The Reluctant

In Focus: Interacts with minimum interest in the surrounding. Listless, reluctant or a speedster in order to finish</td></tr>
<tr><td rowspan="2">The scholar

In Focus: The way they approach new things and knowledge and their application</td><td>The seeker

In Focus: A problem solver, one who seeks answers either by collaboration or working things out</td></tr>
<tr><td>The behaviourist

In Focus: Requires and wants step by step instruction and direction. Believes only in positive reinforcement and expects no failure (or challenge)</td></tr>
</table>

Table 9.2: The Outcome Space

9.3.3 External views

Though Larsson et al (2010) states that one should avoid the participants stating what should be or ought to be, so as to avoid *"superficial descriptions"* and keep to the concrete examples; the nature of the interviews meant that participants would state how the phenomena in question could be used or improved. It was felt important to keep these and is therefore included in the discussion. In fact some extra discussions were held with some of the participants, as any insight provided could only be considered as useful. These views though not directly related to their experience were indirectly related.
They came from either the direct interviews conducted or from views expressed after the completion of interviews.

From the point of view of liberal pilgrim the following were mentioned.

Participant L:
"But it's not about that, it's about the stick ability of the learning. Hmm, so the reason people are probably saying about that is probably of the constraints, that we put learning into in classrooms. Hmm, this probably doesn't fall into the classroom learning but it would fall within, flip learning or blended learning. That's certainly something you would give some of the students to do outside of the classroom and then come into the classroom the next day and then you could discuss the metalloids a bit further or the scientists or whatever you wanted to do. So in terms of the future of education, that would be very, hmm, that would be the kind of thing that people would need because that's the type of thing that the students would do outside of the classroom, and hmm, and it's not about all the facts that they are learning, it's about the fun of finding the learning."

Participant O: *(Regarding having no fighting) "But that would take away one of the fundamental aspects of an RPG. There has to be the challenge of progressing against the odds so to speak. Plus there is no reason for this to be limited to a specific age group is there. You could I assume tailor the puzzles to different age groups where fighting would be less of an issue."*

From the point of view of the conservative pilgrim, the following were mentioned.

Participant N: *(Regarding the fighting) "Yes I know, but they are not always right, and they're being you know immersed in a culture of violence so I have pretty strong thoughts about not supporting that."*
Q: *"They are only in dungeons and then it is only skeleton and rats."*
Participant N: *"Well that's good, but still feels the same, for me it just doesn't feel right, you know slicing up rats. But again I suppose there is that balance to strike with engaging children, but I don't think it's right, it's just me, it's my preference.*
I think students need to be guided, even if they prefer to have lots of fighting, that doesn't make it right, you know what I mean? It doesn't make it a good thing to have, maybe they would have wanted to have a lot of sex in it too, you wouldn't put a lot of sex in it though, but people seem to be ok with violence, I don't know."

A conversation about removing the world and just having puzzles, participant H felt that it would not work, as the participant was a hard gamer, they were asked if the concept of grinding would work with that being related to only having instructional content for the rest of the game.

Participant H: *"Potentially yes, you could have some sort of loop based system. A lot of games I've played you have the idea of grinding towards something which means taking part in an activity you're not particularly keen on doing, but you'll do it over and over again just because you know a nice fancy sword or something else at the end. Yes, you could put educational content in there, being the grinding thing that has to be done to get…"*

Q: *"What would you think if the game only had the puzzles in the rooms and nothing else?"*

Participant L: *"I think if you did that, you would lose the whole purpose (laughs), of the game. I think probably where people are coming from is that if you had an hour of learning, hmm, like lessons are chunked to an hour, then hmm that would be quite a slow way of learning, but from what the perception is, why can't you just give people that information up front. Hmm, but that's not the point, the point is someone discovering the learning and hum the bits in between are what makes the learning more engaging. So I think, what you'd find is that, that learning would stick more than if you just said "these are the*

metalloids, these are the people (laughs), this is them you know this is what you want to do" You could do that in five minutes actually, five ten minutes."

Participant P felt that though they understood the concept of the game, they were excited about the use of the puzzles as plenary sessions and the main game could be used as an extra, in an after school club or for homework.

Participant P: *"It would be good if you could just use the puzzles."*

Participant P: *"Would be good for an after-school club."*

Participant P felt that though they understood the concept of the game, they were excited about the use of the puzzles and the following is summary of our discussion

Participant P felt that though this might be difficult to use in a classroom situation, he did feel that it would be good to use in an after school environment or to engage and motivate those that were not engaged and motivated. He also felt that the different world could be used for different curriculum areas. He was excited by the puzzles and felt that these could be used on their own with many variations for plenary etc. In fact there was a long discussion and interest about how I had come up with these types of puzzles and the question was asked, was it because I was a gamer that I had come up with these ideas or was it already part of the engine?

9.4 Summary and Discussion

The question of whether the game is seen as an educational tool or game was important; this was a follow up question to their overall experience of the game. The other important question to be answered was what would be the experience if there were only the rooms with puzzles.

What are the perceptions and experiences of Educators, Students and gamers/non gamers of the artefact?

Some of the participants wanted it to be more of a game where the action was more concentrated (H) whereas others seemed to want it not to be open (P and J) and wanted the game just to concentrate on the actual puzzles. Though participant P did see the benefit even though they felt the environment would be hard to play during class time due to time constraint and focus on other than educational content, they suggested that it would be useful for after school clubs. Whereas participants J would have been happy with just the puzzles found the most of the world either tedious or distracting, participant N did not enjoy with most of the aspects of the world especially the puzzles. The rest seemed happy with the balance of exploration and puzzle and some looked at it as an adventure.

It was clear form this that there was a bell curve here with one who did not like games but wanted a pure learning tool, another couple who considered it as a game but either felt it required more action or less educational signposting. And another who liked the world but felt the puzzles and the world should be used for different uses and one who just did not like the world and just wanted the puzzle.

On the aspect of removing the puzzles as a separate game, only two felt that would be a good idea, but the one did feel that the other game element should be kept and used for other purpose to support the puzzles. All the others felt that just having the puzzles would not be beneficial and would make it just a learning tool.

What was gratifying was that many did not think of it as an educational game and apart from one the rest considered it as a game rather than a learning tool.

Participant E: *"Well I thought, I never really looked at it as an educational game but my first initial ideas before I played the game was it was going to be you've got to put in letters and numbers and stuff but is not it's more of a just Oblivion with more of an educational puzzle."*

What motivates and engages a player?

Some of them were motivated and engaged by the fact that they had to solve the puzzles in order to progress. Some true type gamers (though not all), just wanted to complete the level without exploring; these either hacked or found the

quickest route. Their concentration seemed to be on getting through the level rather than immersing themselves or taking note of the environment. One also constantly compared it to the graphics of Skyrim and also felt that there was not enough action; specifically of the fighting type. However this participant had trouble with the puzzles. The other gamer felt that the education element was too obtrusive and needed to be more intrinsically woven into the game; more like Assassin's Creed where the educational elements are "more of a lore", than necessary to the game.

Some Issues

The environment should have all the clues, it did, but supplementary evidence was also given in the form of a book. This was a mixed reaction, there were those who felt it was a good idea, but two participants felt this was not a good idea and that the environment/game should have all the clues. However some gamers when stuck will look at forums for help and some gamers will also look to find extra supplementary details of the game or elements they find in a game in a form of Portnow and Floyd's (2008) concept of tangential learning. Here the aim was for blended learning style, but some would argue that all clues should be endogenous to the game, in order for the puzzle to be solved. There were clues in the form of a book which had the details required, but extra information was provided in the form of a real book on elements

Fighting

One participant felt that fighting should not be included at all, whilst another felt that there should be more of it. One was a gamer, the other an educator. This concept of fighting was something that came up in the design of prototype 2 (collaborative design mentioned in section 9.2).

Control

Many had problems either adjusting to controls from console to PC or did not know the controls at all. Though again a book was provided with details of the controls, the normal tutorial phase where players would learn the controls was missed out due to time constraints. In hindsight, maybe this section should have been left in rather than bypassed.

The game was designed and used with the philosophy of Constructivism, in the sense that though there was elements of guided discovery, enquiry-based reasoning, they had guidance/scaffolding and were not left to just play the game by themselves. Even those who were gamers felt the need to collaborate or seek help on occasion. This came either from the educator, peers who had prior knowledge to help others construct the solution or from some form of guided discovery either from the game, peers or educator. A game like Minecraft may be considered more of an open ended discovery learning and may suit some, however the game I designed has elements of all these. Having said that, the puzzles do have a sense of discovery, but are open to constructivism in the sense that at the time of testing, there was checking of student understanding and hints on ways to solve the problem. For instance with some students it was enough to give them the book (if they had prior knowledge and just needed a refresher), with others it was enough to ask them “that Cu, you said was Copper, is it a Metal or a Metalloid?” (Responding and working out if this is metal then it can’t be the same as metalloid), so pick all the ones that you know are not metals. Others needed more guidance (look at the periodic table, if CU as you pointed out is metal and metals and metalloids are different, what else is in that colour in the periodic table and in the puzzle? So what is in our puzzle and not in that represented with metals?). Some, just looked in the book under metalloids, but most only looked as far as the periodic table to see if they could work it out; either by themselves or with help.

What did they learn? At the very least that there was a difference between metals and metalloids and some learnt that the periodic table organised and showed different colours to help them identify where they should look.

The fear was that they would just try different combinations randomly, hoping to get a result. Only one tried randomly to step on the pieces without any thought and was gently guided to think about it, others when stuck tried to work it out or an educator, or myself intervened to discuss the possibilities. It was important that they were not given the answer, but gently guided to feel they had accomplished the task by themselves. Those who worked it out either by themselves or with some intervention seemed more pleased with their achievements than those who had to be told the answer or who had discovered the list of metalloids in the book and then just stepped on them without going

through the feeling of figuring it out somehow. Only one had a really hard time with the whole concept and tried stepping on all the pieces and was frustrated that they could not open the door with the lever. They felt that they should have been able to step on all the pieces and therefore by default they would have stepped on the five correct ones. This was a participant who did not play games and found the whole aspect bizarre and unfair. Even with sitting down and working out the logic of the puzzle led to annoyance and in the end, they were told which ones to step on.

It was clear from the discussions that ensued and the categories of description that were formulated that there would always be the following.

- Those who just did not want to play games at all (though only 1 out of 18)
    - Not everybody plays games and therefore not everybody would be engaged and motivated in playing a game to learn from
- Those who preferred a learning tool style (2, though 1 did feel the game would also be useful)
    - The need to have clear educational focus and signposting of the content
    - Aspects such as challenge, competition or fantasy are often interpreted purely from the viewpoint of educational pedagogy and instructional design paradigms and therefore seldom correlate to the essence of the game design principles.

- Those who needed more gameplay (2).
    - These wanted either more action or less obtrusive educational content

It was also clear from the discussions and the categories of description that the different experiences lay on a continuum of one extreme or another.

It is therefore suggested that the framework defined in section 4.3 of having “A game of two halves” would be an appropriate solution.

Where the Academy section would only have timely, focused content, driven primarily by sound pedagogical principles with the content clearly signposted as

Whitton (2012) advocates it is important for players to know they have learnt something, in reference to her statement of Prensky (2001) who states that players learn without realising it. This signposting would also ensure that players do not miss what Wechselberger refers to as *"the educational framing clues"* (2009)

This could be used within the current educational system.

The other half of the game referred to as Main World would contain more varied gameplay and types of quests including educational content; the Academy World acting as grind achievements.

This could be used as flip-learning, extra curriculum/homework activity.

One influenced heavily by game design principles and student gamers and the other designed by what educators want and require.

Details of this conceptual framework are included in Chapter 6, section 6.3.

Part VII: Conclusions

10 CONCLUSIONS

This final chapter brings together the whole research and highlights the important insights that were drawn from the overall thesis. The overall aim of this thesis was the **Research and Development of a Digital Game Based Learning Framework for Education: Designing for Educators and Students.**

Section 1 revisits the research questions in order to ascertain and consider how each of these has been answered by the work undertaken.
Section 2 provides a discussion of the contribution to knowledge, a critique of the processes and results from the studies undertaken.
Section 3 considers the limitations of the research and directions for future studies.

10.1 Critical overview of the research

The main research question was:
Can we design and develop a Game-Based learning environment that satisfies the needs of both educators and students?

- In order to investigate this, the question was broken down into:
- How did researchers perceive Serious Games?
- What did Educators and Students want from a Serious Game?
- What were the perceptions and experiences of Educators, Students and gamers/non-gamers of the artefact?
- What is it that motivates and engages players?

10.1.1 How did researchers perceive Serious Games?

From the Literature review undertaken in Chapter 2, it was clear that there was a need for a common vocabulary. Not just in relation to Game Designers and GBL Researchers but amongst GBL researchers in general. At present Serious Games means different things to different people. This thesis considered DGBL from the viewpoint of it being an educational SG, to distinguish it from other types of SG but situates the DGBL within Marsh's interpretation of Serious Games as previously mentioned in section 2.5.2. It aimed to encapsulate in its design and development, educational pedagogy with all the characteristics of games.

One of the main points that came from this review was that motivation and engagement of video games were often cited as the reason to use games but then used for discussion, design or development of non-video games. There is nothing wrong with using these concepts for non-video games or for gamification. But extrapolating and then comparing them in research or design of non-video games does not give a true indication of the potential of SG and does a disservice to this field of research.

There is therefore, a disconnect between the expectation of what well-designed entertainment games could deliver to players and what Serious Games often deliver in terms of design and implementation. There is also a divide between the understanding of design concepts in terms of a video game and that of an educational game.

There should be a distinction between Digital Game Based Learning types within the Serious Games domain; those that are considered as games (video games or other types) and those that are either in the category of educational learning tools, CALs, computer simulations or educational applications.

There needs to be an understanding that different types of DGBL are useful for different purposes, content and context.

10.1.2 What do Educators and Students want from a Serious Game?

There is a disparity between what student/gamers expect from a game and what an educational game actually delivers. Often times the design of an educational game is heavily influenced by the learning content at the expense of the essence of the game and gameplay. Students wanted and expected a game that was both fun and challenging, whereas educators wanted a game that was imbued with sound pedagogy. This meant that the learning goals had to be clear, that it was pedagogically sound and that there was clear branding of the content so that players would not miss the cues of the educational content. The initial study in Chapter 6 showed that students and educators had different views of what an educational game should include.

Educators overall, wanted fun after the learning outcomes had been achieved; this was more edutainment style that students did not favour.

They also did not like the idea of a student failing in the game whereas students felt the whole concept of games were that you could fail.

Educators were also more concerned with feedback and assessment as well as the game being focused and timely. This concerned students who felt that a game would only contain educational content and that it would be more of a learning tool than a game. Students placed importance on fun, good character/world interaction, storyline and appropriately challenging.

Educators placed little importance on the storyline but felt that it was more important to have facts rather than fantasy, whereas students felt that believability (verisimilitude), was more important within the storyline. The challenge part was a good discussion point where educators felt that it must not be too challenging, whereas students felt that it should not be too simple but needed to be fair. They felt that current educational games they had come across were not challenging enough.

Both sides agreed that the game had to be motivating; educators just wanted to feel that students were motivated but students felt that this really was dependent on the type of game. This is one of the main points, in order to engage and motivate students who are amotivated but enjoy playing games, the

game will not engender this unless it is a game and, what Prensky refers to as a complex game.

It was clear that these two sides would never agree and that the views and perceptions of what would motivate and engage students in a game had opposing views.

It was clear that it would be difficult to design and make a game that would suit such diverse views. This led to the formulation of a framework that would incorporate both ideals.

Evidence from the research also showed that there was often either difficulty or misuse in combining the game design principles that were cited, to the educational pedagogy. Aspects such as challenge, competition or fantasy are often interpreted purely from the viewpoint of educational pedagogy and instructional design paradigms and therefore seldom correlate to the essence of the game design principles.

The expectation of what a well-designed entertainment game delivers and what a Serious Game often delivers shows the disconnection between understanding the nuances and differences between the two domains. This often resulted in a learning tool rather than a game, or at best a gamified version of a game; neither of which fulfils the student's expectations.

10.1.3 What were the perceptions and experiences of Educators, Students and gamers/non gamers of the artefact?

The Phenomenographical study showed that the experiences of the participants fell on a continuum confirming the research that there were different views on both sides of the framework. These experiences were mapped to Categories of Descriptions; the following were used as metaphors to categorize the various experiences:

The tourist where the main focus lay in the initial perceptions of the world that they entered.

The novitiate where the main focus was that of the tourist understanding the rules and objectives of their environment and how to get around the world.

The journeyman is where the main focus lay in the growth of the player in mastering their environment and gaining the experience towards a more seasoned traveller.
The pilgrim where the main focus was in the way the world was perceived.
The explorer considered the aspect of the interaction with the environment.
The scholar showed how new experiences and knowledge were approached and their application.

It was found that each category of Pilgrim, Explorer and Scholar had distinct opposing emotions on a continuum and it was felt important to show these; therefore each of these showed the two main views.

The pilgrim could be split into two main characters with a tendency to view and experience the world as:

- As a conservative pilgrim
    - The conservative's main focus was traditional and expected a game or a learning tool
- As a liberal pilgrim
    - The liberal was open minded and receptive to new ways

The explorer could be split into two main characters with a tendency to view and experience the world as:

- As a reluctant explorer
    - The reluctant explorer finds little interest in discovery or exploration of their environment and will often be either listless or speed through just to achieve the objectives required
- As a curious explorer
    - The curious explorer is interested in new experiences. Interacts with the world with curiosity and an enquiring mind

The scholar could be split into two main characters with a tendency to view and experience the world as:

- As a behaviourist

    - The behaviourist required and expected step by step instruction and direction. They only believed in positive reinforcement and expected no failure. They often found challenges difficult
  - As a seeker
    - The seeker was a problem solver, one who seeks answers, either by collaboration or working things out.

It was clear from the discussions that ensued and the categories of description that were formulated that there would always be:

- Those who preferred a game that adhered to the pure educational instructional design paradigms, with clear signposting and focus on educational content
  - This seldom correlates with the essence of game design principles and loses many aspects of gameplay
  - This type of game is more a learning tool or gamified game
- Those who needed more gameplay
  - These wanted either more action or less obtrusive educational content
- Those who just did not enjoy or want to play games
  - There will always be some who do find games enjoyable, motivating or engaging

The study and research also show that there will always be those that are not motivated to play games, though that should not be the only reason to discount Serious Games within the realms of education.

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This seemed to validate the necessity of the framework of a game of two halves that was originally suggested in Chapter 6, section 3.

10.1.4 What motivates and engages a player?

The research indicated that different aspects of a game motivated a player but in order to keep them engaged, the aspect of gameplay was of paramount importance. Motivational factors such as Autonomy, Competence and Relatedness were looked at, as well as intrinsic and extrinsic motivation. Instructional motivational factors were also looked at as well as fun and flow.
Research showed that elements that were conducive to motivational instructional environments were Challenge, Fantasy and Curiosity.
Though there may never be a definitive answer as to what motivates players to play, there was evidence that some of the factors that influence this were aspects such as Challenge, Socialisation, Exploration, Control and Curiosity. It also became clear that some of the aspects that players expect from a game were, Fairness; Control, Choice and Empowerment; Interactivity; Feedback; Verisimilitude; Flow and Fun.

In relation to games the evidence generally was that good aspects of gameplay were considered to be those experiences that affected our emotions from one spectrum to another on a continuum.

Finally the term fun was re-examined in relation to the concepts of emotion, experience and aesthetics; though it still defies definition, it seems clearer that it sits somewhere between gameplay and emotional experience.

10.2 Contributions of the thesis

An attempt was made at the clarification of terms and to show that there is a need for a common vocabulary, amongst researchers within the field of Educational Serious Games. There is also the need to ensure that we do not situate the benefits of video game concepts and then to compare them to non-video game situations, shown in Chapter 2. This is an important factor, not only for SG but will also help in correctly evaluating the impact of SG and help to

progress the field. We need first to have a common vocabulary and consider distinguishing the different types of DGBL within SG. This will ensure that when researchers evaluate a game they are evaluating equivalent types. There needs to be a distinction between different types of games (Video Game, Flash type, CAL, Simulations, Learning Tool etc.)

A conceptual framework that suits both educators and students was required.
In order to achieve an educational game that is in Marsh's range1 of his continuum *("Video games with fun & challenging gameplay for purpose"*) as mentioned in section 2.5.2, it is proposed that "a game of 2 halves" is considered. This conceptual framework needs to take into account what student gamers expect in a game (fun and challenging game play) and what educators expect (Game for purpose).
The Academy will contain grinding quest for the main players but include what Wechselberger (2009) terms as *"educational framing clues"* throughout to ensure that it follows instructional design and pedagogy. The only difference between the educational content in both worlds is the framing, the main world would follow sound pedagogical principles but with less framing and incorporate more of the essence of game design principles.
The Phenomenography Study seemed to validate the need for the framework of a game of two halves that was originally suggested in Chapter 6, section 3, in order to satisfy the requirements and expectations of each party.

The Phenomenography study and the categories of description was expanded to ensure it encapsulated games and gamers/non-gamers by showing the experiences on a continuum. This use of the continuum to show both sides of the spectrum was important and invaluable to give depth to the study and align itself to reality of experience and emotions; as these are rarely black or white or that emotions are not binary (Adams, 2014) but on a continuum.

10.3 Research methods

Though a mixture of research was used, the use of Phenomenography was an excellent conduit to the experience of the players. It gave an insight that could have been missed with other types of methods. The most useful aspect was that it helped confirm that while experiences of people differ, they still share some sameness. Also, whilst different researchers would come up with different categories of description, and the methodology itself could be questionable in some areas of research, it was an invaluable tool in this instance. It helped clarify certain aspects and confirmed that in order to satisfy both the educators and students, gamers and non- gamers that a new perspective was required.

10.4 Designing a Serious Game

One of the greatest challenges in designing an educational game is to marry the expectations of students with the requirements of educators. Educational games have either concentrated on the fun aspect with a bit of educational content thrown in or have been an educational tool with fun/ game play bolted on. Research has shown that both these approaches have failed dismally to harness the potential that Game Based Learning has to offer. Initial discussion showed that educators wanted fun/gameplay elements after the learning, with no failing allowed, feedback, assessment, timely and focused and, facts not fantasy. Whereas students wanted a bit of fun, they wanted it challenging, good interaction and some storyline and they did not just want a teaching aid.

It was important to show that most pedagogical concepts are woven intrinsically into game design principles.

A game that is too easy or has too many hints leads to boredom, one that is too difficult leads to frustration; both eventually lead to lack of motivation. This balance of fairness and challenge is one of the main principles of good game and level design. Good game design also incorporates the player's progression through the various challenges and quests, often in the form of a quest journal. Here the player can easily keep up to date with progress and revisit objectives. Books and journals are another way that this interaction can be included; these

usually provide extra material and information that the player may need to know.

The behaviourist perspective can explain how well designed games give immediate feedback so that the player learns how to react to certain situations. Sounds and music are often used to warn the player as are visual cues; this is classic stimuli response behaviour. Positive and negative reinforcements are also used; the punishment or reward, however, should fit the deed and be at an appropriate level to maintain motivation. This type of fairness in a game is paramount in good game and level design.

A well designed game can also give the player a sense of constructing their own outcome. This can be in the form of choices they make or paths they have taken in the game.

Elements of Cognitivism and Constructivism can also be found in well designed game. For instance puzzles and adventures to enable players to think and process information to deal with new information. Video games have the ability to give interaction and feedback required in for instance Kolb's experiential cycle. This can be done through NPC interaction by direct dialogue or actions performed by them. A good design will give the player cues that can be either audio or visual. A chest, for instance, that can't be opened because a key is needed, would have a text message stating that the player needs a key. It is important to balance the level of difficulty and challenge in order for the player to feel a sense of achievement and be motivated to carry on playing. This balance between boredom, challenge and frustration is important in achieving Csikszentmihalyi's optimal flow.

10.5 Limitation of the thesis and Future studies

Game Based Learning and Serious Games have been looked at as a whole rather than as a fragmented research element and although this research has answered some of the questions it aimed to, this thesis still has several limitations which provide opportunity for further studies.

10.5.1 Limitations

The main limitations were that the Academy was not tested, though elements and the concept of the puzzles made a significant contribution to the feel of types of gameplay that would be included in this area. The main difference was that this would include only learning content and be sign posted as educational much more than the Main World.

It would have been useful to have conducted a longer study to incorporate the elements that were missed, such as the initial starting of the game and the Academy world as a grind area for the Main world as well as a learning world that only included learning content. It would also have been useful to have left the other non-educational games in the main world that were developed with prototype 2 and that were bypassed to ensure that only the educational content was made available.

The issue of balancing the depth and breadth of the research was a concern, the field of research was by necessity a broad field and there were many elements that could be a field for future research, some of these were the concept of player types.

The gamers were asked about their experience of playing RPG in order to further add depth to the study and ascertain the types of players; however as only 13 participants were gamers and only 11 who were eventually interviewed for this part, it was felt that this could be a subject for future study.

The questions were “What are things that interest you as an open world RPG player?” and a question on morality and precision.

It would have been interesting to see if the categories of description would be any different to the research already carried out in this field. Another aspect would be to correlate this to the study already carried out to see the experiences of gamers’ experiences and expectations of RPG games they play for leisure to the one designed as an informal educational game and see if there was a significant difference between the two.

10.5.2 Further Developments to Weogorna Civitas

This concept could be developed to include many subject areas within the world of Weogorna Civitas. One such province, Khemia that was developed for the Chemistry prototype could be added to, the Chemistry area itself could be developed to include many aspects.

Other add-ons could include for instance lands where different languages are spoken and interaction with the NPC could be only in that language. One could add English literature where the NPC are part of a play and are confused about which dialogue or scene they should be in, and it would be up to the player to help them. The possibilities are endless. Biology, History, Architecture are all elements that could be exploited and used satisfactorily in this medium.

Movies can be played within the game as a cut scenes, various music can be played as a quest of types of music that can be triggered for musical knowledge (though movies and music would need permission).

Skill achievements could be developed in order to keep track of the player's progress in a particular field. Journals could be used to write in details of what was found on the player's journey, or the game could automatically write this in their journal.

The use of factions, which was used to a limited scale, could be included from the different faculty areas. NPC mentors could be designed to help with certain tasks. Commentary nodes used in the game could be expanded as special help points.

The use of crafting could be used, for instance making a sword but with the correct elements that they have to find and identify.

The potential of an RPG is huge, though complex and time consuming for one person.

Once the initial world is constructed, the use of participatory design and development between students and educators could also bring additional benefits. This could be done for various subjects and inter curricular activities, between educators and students or students from different subject areas working in collaboration; each bringing an area of expertise.

10.6 Summary

If our aim is to spark curiosity, engage and motivate those who are not motivated, then an informal design of a Serious Game utilising both good pedagogy and sound game design principles is the way forward. But if our aim is to ensure that the educational pedagogy is clearly defined in the form of educational cues and content, then the design, development and use of video games is overkill; the solution here would be either a learning tool or a gamified game. If all we want to do is port the existing methods into a medium, then a video game is not the medium.

The other option if one is determined to go down this route is to split the game as suggested and have an Academic area for use in class and the Main world for use as a method of flip-learning. The Academy would have all the educational cues that educators need. The Main world would include educational content and could be used by ensuring sufficient scaffolding, feedback and should also include opportunity for dialogue and discussion afterwards in order to consolidate and integrate (Beetham, 2007), but would maintain the essence of a game. Games are not motivating to everyone, but that is not the reason not to use them (Whitton, 2007). However if we are going to consider using this medium for those who are engaged and motivated to play video games then we need to ensure we design it using both sound educational pedagogy but ensure that we also include the essence of what a game worth playing: the gameplay.

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Unity: https://unity3d.com/

Appendix 1: Survey Details

For Students and Educators

Use of Video Games by Students

1. Which type of educational establishment do you attend?

	Response Percent	Response Count
Secondary	4.5%	4
FE College	**85.2%**	**75**
University	9.1%	8
Not Applicable	1.1%	1
Other (please specify)		0
answered question		**88**
skipped question		**0**

2. What is your gender?

	Response Percent	Response Count
Female	23.9%	21
Male	**76.1%**	**67**
answered question		**88**
skipped question		**0**

3. What age group are you in?

	Response Percent	Response Count
11-16	8.0%	7
17-19	**77.3%**	**68**
20-25	12.5%	11
26-35	1.1%	1
36+	1.1%	1
answered question		**88**
skipped question		**0**

4. Do you play Video Games, and if so what genre? (tick all that apply)

	Response Percent	Response Count
Do not play Video Games	9.3%	8
Sports	41.9%	36
Strategy	50.0%	43
First Person Shooter (FPS)	**68.6%**	**59**
Role Playing Game (RPG)	54.7%	47
Action-Adventure	61.6%	53
Simulation	36.0%	31
Other (please specify)		7
answered question		**86**
skipped question		**2**

5. What motivates you to play video games (Rank these in order of importance 1 being the highest)

	1	2	3	4	5	6	7	8	Rating Average
Challenge	**23.6% (17)**	20.8% (15)	13.9% (10)	8.3% (6)	9.7% (7)	11.1% (8)	5.6% (4)	6.9% (5)	3.50
Competition	14.1% (10)	18.3% (13)	11.3% (8)	11.3% (8)	9.9% (7)	7.0% (5)	**19.7% (14)**	8.5% (6)	4.27
Sense of Immersion	**16.4% (11)**	10.4% (7)	11.9% (8)	9.0% (6)	14.9% (10)	**16.4% (11)**	10.4% (7)	10.4% (7)	4.39
Graphics and Aesthetics	13.9% (10)	8.3% (6)	15.3% (11)	**23.6% (17)**	15.3% (11)	12.5% (9)	6.9% (5)	4.2% (3)	4.04
Fantasy	5.6% (4)	6.9% (5)	6.9% (5)	13.9% (10)	16.7% (12)	12.5% (9)	**22.2% (16)**	15.3% (11)	5.32
Social Aspect	6.9% (5)	11.1% (8)	11.1% (8)	15.3% (11)	13.9% (10)	**20.8% (15)**	8.3% (6)	12.5% (9)	4.76
Storyline/Narrative	**18.2% (14)**	14.3% (11)	**18.2% (14)**	16.9% (13)	7.8% (6)	10.4% (8)	11.7% (9)	2.6% (2)	3.73
Achievements	4.9% (4)	12.3% (10)	12.3% (10)	7.4% (6)	13.6% (11)	8.6% (7)	11.1% (9)	**29.6% (24)**	5.31
								answered question	
								skipped question	

6. What other factors motivate you to play video games?

	Response Count
	56
answered question	**56**
skipped question	**32**

7. Have you ever played a video game for educational purposes? If yes please state which one(s). If no please state none.

	Response Count
	84
answered question	**84**
skipped question	**4**

8. How valuable do you think Video Games could be for learning?

	Very Valuable	Some Value	Unsure of Value	Of Little Value	Not at all Valuable	Rating Average	Response Count
Video Games are	20.2% (17)	**51.2% (43)**	16.7% (14)	6.0% (5)	6.0% (5)	2.26	84
					answered question		**84**
					skipped question		**4**

9. I am designing an educational game. What do you think I should concentrate on? Please tick one only.

	Response Percent	Response Count
Learning Content Only	1.2%	1
Equal Fun and Learning	**61.9%**	**52**
Learning Foremost then Fun	8.3%	7
Fun Foremost then Learning	28.6%	24
answered question		**84**
skipped question		**4**

10. What do you think motivates you to learn a subject? 1 as High Importance - 7 as Low Importance. You may score the same for several choices.

	1	2	3	4	5	6	7	Rating Average	Respons Count
Interesting/Stimulating method of teaching	**33.3% (28)**	21.4% (18)	26.2% (22)	2.4% (2)	6.0% (5)	7.1% (6)	3.6% (3)	2.62	8
Interesting/Stimulating subject	**46.4% (39)**	25.0% (21)	10.7% (9)	4.8% (4)	4.8% (4)	2.4% (2)	6.0% (5)	2.27	8
Interesting/Stimulating teacher	25.0% (21)	17.9% (15)	**32.1% (27)**	6.0% (5)	8.3% (7)	9.5% (8)	1.2% (1)	2.88	8
Competion with themselves or others	13.1% (11)	17.9% (15)	10.7% (9)	**25.0% (21)**	14.3% (12)	11.9% (10)	7.1% (6)	3.74	8
Challenge	15.5% (13)	**22.6% (19)**	16.7% (14)	16.7% (14)	17.9% (15)	8.3% (7)	2.4% (2)	3.33	8
Grade requirement led	10.7% (9)	**26.2% (22)**	9.5% (8)	16.7% (14)	10.7% (9)	19.0% (16)	7.1% (6)	3.76	8
Vocational requirement	9.5% (8)	14.3% (12)	15.5% (13)	13.1% (11)	14.3% (12)	7.1% (6)	**26.2% (22)**	4.35	8
							answered question		**8**
							skipped question		

Page 1, Q4. Do you play Video Games, and if so what genre? (tick all that apply)

1	racing	Jun 14, 2012 7:19 AM
2	MMORPG	Jun 14, 2012 7:18 AM
3	Visual Novel	Jun 12, 2012 2:55 AM
4	MMO	May 17, 2012 2:04 AM
5	third person shooter	May 17, 2012 2:03 AM
6	All	May 15, 2012 8:06 AM
7	Fighting Games, Racing Games	May 10, 2012 12:46 PM

Page 2, Q6. What other factors motivate you to play video games?		
1	interactiveness small details	Jun 14, 2012 7:25 AM
2	Enjoyment, escapism, recreational purposes	Jun 14, 2012 7:25 AM
3	I find them fun and Waste time when nothing to do also if you record gameplay it can be n income of money	Jun 14, 2012 7:23 AM
4	It is fun and very interesting.. wastes time	Jun 14, 2012 7:23 AM
5	very high spec computer	Jun 14, 2012 7:21 AM
6	It is a worthwhile pastime	Jun 12, 2012 6:28 AM
7	When I'm bored.	Jun 12, 2012 6:27 AM
8	Being Bored	Jun 12, 2012 6:27 AM
9	completion	Jun 12, 2012 6:26 AM
10	fun and excitement	Jun 12, 2012 6:26 AM
11	Talking to friends over xbox live.	Jun 12, 2012 6:25 AM
12	boredom	Jun 12, 2012 6:25 AM
13	boredom	Jun 12, 2012 4:06 AM
14	Boredom	Jun 12, 2012 4:06 AM
15	boredom	Jun 12, 2012 4:05 AM
16	Boredom	Jun 12, 2012 4:05 AM
17	The variety of games that are available	Jun 12, 2012 4:05 AM
18	none	Jun 12, 2012 4:04 AM
19	Enjoyable	Jun 12, 2012 3:06 AM
20	enjoyment whilst playing	Jun 12, 2012 3:05 AM
21	Sense of achievement when you complete something.	Jun 12, 2012 3:01 AM
22	enjoyment	Jun 12, 2012 2:59 AM
23	Escapism from real world problems.	Jun 12, 2012 2:59 AM
24	Lots of violence Online Multiplayer	Jun 12, 2012 2:59 AM
25	Spare Time	Jun 12, 2012 2:44 AM
26	Fun	Jun 12, 2012 2:43 AM
27	fun	Jun 12, 2012 2:43 AM
28	If it is on a topic/story I enjoy.	Jun 12, 2012 2:43 AM
29	None	Jun 12, 2012 2:41 AM

Page 2, Q6. What other factors motivate you to play video games?		
30	How well the game has been rated, the popularity. Whether or not I have played previous games of the same kind or type.	Jun 12, 2012 2:41 AM
31	the way it looks	May 23, 2012 3:50 AM
32	the look of the game	May 23, 2012 3:46 AM
33	beating my high score	May 23, 2012 3:41 AM
34	competition	May 23, 2012 3:37 AM
35	having fun, progressions within the game	May 17, 2012 2:08 AM
36	games are fun	May 17, 2012 2:07 AM
37	escapism takes me away from real life.Allows me to do things you can't do in the real world.	May 17, 2012 2:07 AM
38	cus games rule andim a nerd!	May 17, 2012 2:07 AM
39	they are a sequel to another game i have played	May 17, 2012 2:07 AM
40	if it appeals to my nature	May 17, 2012 2:06 AM
41	friends	May 17, 2012 2:06 AM
42	gameplay and storyline	May 17, 2012 2:05 AM
43	if i have played the series before like Fallout i know thats a good game and worth playing.	May 17, 2012 2:05 AM
44	none	May 17, 2012 2:05 AM
45	Talking and playing with others mainly.	May 17, 2012 2:05 AM
46	bordem	May 17, 2012 2:05 AM
47	N/A	May 17, 2012 2:05 AM
48	na	May 17, 2012 2:04 AM
49	Cooperative gameplay.	May 15, 2012 8:13 AM
50	N/A	May 15, 2012 8:12 AM
51	For the entertainment	May 15, 2012 8:12 AM
52	Fun	May 15, 2012 8:09 AM
53	boredom	May 15, 2012 8:08 AM
54	Creativity and customization. I would rank those as number one above if I had the option.	May 11, 2012 6:46 AM
55	fun	May 11, 2012 1:24 AM
56	Friends	May 10, 2012 12:45 PM

Page 2, Q7. Have you ever played a video game for educational purposes? If yes please state which one(s). If no please state none.		
1	simple educations games like hangman and matching up things etc.	Jun 14, 2012 7:25 AM
2	Yes, LOTS	Jun 14, 2012 7:25 AM
3	Nope.	Jun 14, 2012 7:23 AM
4	Bitessize games	Jun 14, 2012 7:23 AM
5	no	Jun 14, 2012 7:21 AM
6	None	Jun 12, 2012 6:28 AM
7	Bitesize.	Jun 12, 2012 6:27 AM
8	Bitesize	Jun 12, 2012 6:27 AM
9	no	Jun 12, 2012 6:26 AM
10	none	Jun 12, 2012 6:26 AM
11	None	Jun 12, 2012 6:26 AM
12	No, but you can often learn a lot from the game. For example, FIFA has given me great knowledge of players abroad and their performance.	Jun 12, 2012 6:25 AM
13	none	Jun 12, 2012 6:25 AM
14	no	Jun 12, 2012 6:24 AM
15	None	Jun 12, 2012 6:24 AM
16	None	Jun 12, 2012 6:24 AM
17	none	Jun 12, 2012 4:06 AM
18	yes brain training	Jun 12, 2012 4:06 AM
19	yes brain training professor Layton	Jun 12, 2012 4:06 AM
20	no	Jun 12, 2012 4:05 AM
21	No.	Jun 12, 2012 4:05 AM
22	yes, at highschool i used the games on bitesize	Jun 12, 2012 4:05 AM
23	yes	Jun 12, 2012 4:04 AM
24	No	Jun 12, 2012 4:03 AM
25	No.	Jun 12, 2012 3:06 AM
26	No	Jun 12, 2012 3:05 AM
27	No.	Jun 12, 2012 3:01 AM
28	None	Jun 12, 2012 2:59 AM
29	no	Jun 12, 2012 2:59 AM

Page 2, Q7. Have you ever played a video game for educational purposes? If yes please state which one(s). If no please state none.

30	no	Jun 12, 2012 2:59 AM
31	Yes when I was at primary school but I can't remember what it was called	Jun 12, 2012 2:59 AM
32	no	Jun 12, 2012 2:58 AM
33	zoombinies in primary school	Jun 12, 2012 2:58 AM
34	none	Jun 12, 2012 2:58 AM
35	no	Jun 12, 2012 2:58 AM
36	None.	Jun 12, 2012 2:57 AM
37	Cool maths, Bite size.	Jun 12, 2012 2:44 AM
38	yes,quiz	Jun 12, 2012 2:43 AM
39	no	Jun 12, 2012 2:43 AM
40	Linguascope, helped me learn language in a confined way. it made it a lot more interesting and easier to learn.	Jun 12, 2012 2:43 AM
41	None	Jun 12, 2012 2:43 AM
42	None	Jun 12, 2012 2:41 AM
43	NONE	Jun 12, 2012 2:41 AM
44	None.	Jun 12, 2012 2:41 AM
45	Mathmatics across the world	May 23, 2012 3:50 AM
46	mathematic across the world ebot	May 23, 2012 3:46 AM
47	yes, fling the teacher business studies	May 23, 2012 3:41 AM
48	bitesize revision games	May 23, 2012 3:37 AM
49	I've played the professor Layton games on the Nintendo DS and they are educational to an extent with the puzzles involved	May 17, 2012 2:08 AM
50	Yes , Brain Training.	May 17, 2012 2:07 AM
51	No	May 17, 2012 2:07 AM
52	no	May 17, 2012 2:07 AM
53	none.	May 17, 2012 2:07 AM
54	hellllllll noooooo !	May 17, 2012 2:07 AM
55	i have played guitar hero but not sure if thats educational	May 17, 2012 2:07 AM
56	none	May 17, 2012 2:06 AM
57	none	May 17, 2012 2:06 AM

Page 2, Q7. Have you ever played a video game for educational purposes? If yes please state which one(s). If no please state none.		
58	no	May 17, 2012 2:05 AM
59	No	May 17, 2012 2:05 AM
60	none	May 17, 2012 2:05 AM
61	none	May 17, 2012 2:05 AM
62	none	May 17, 2012 2:05 AM
63	none	May 17, 2012 2:05 AM
64	None	May 17, 2012 2:05 AM
65	na	May 17, 2012 2:04 AM
66	None	May 17, 2012 2:04 AM
67	No	May 17, 2012 2:04 AM
68	Yes, I have played "My Japanese Coach" for the study of Japanese language.	May 15, 2012 8:13 AM
69	None	May 15, 2012 8:13 AM
70	N/A	May 15, 2012 8:12 AM
71	Yeah, but at school which was called Mymaths.	May 15, 2012 8:12 AM
72	No	May 15, 2012 8:09 AM
73	none	May 15, 2012 8:08 AM
74	None	May 15, 2012 8:08 AM
75	none	May 15, 2012 8:05 AM
76	None	May 11, 2012 9:53 AM
77	none	May 11, 2012 9:44 AM
78	Yes. Math blasters, number munchers, oregon trail	May 11, 2012 6:46 AM
79	no	May 11, 2012 6:18 AM
80	None	May 11, 2012 5:03 AM
81	None	May 11, 2012 4:36 AM
82	none	May 11, 2012 1:24 AM
83	None	May 10, 2012 12:54 PM
84	Bbc bitesize	May 10, 2012 12:45 PM

Use of Video Games by Teachers

1. Where do you teach?

		Response Percent	Response Count
Junior/Infant		0.0%	0
Secondary		**71.2%**	**37**
College		25.0%	13
University		1.9%	1
Other		1.9%	1
		Other (please specify)	2
		answered question	**52**
		skipped question	**0**

2. What subjects do you teach?

	Response Count
	52
	answered question **52**
	skipped question **0**

3. At what level do you teach?

	Response Count
	52
	answered question **52**
	skipped question **0**

4. Do you play Video Games?

		Response Percent	Response Count
Yes		43.8%	21
No		**56.3%**	**27**
		answered question	**48**
		skipped question	**4**

5. If yes, what genre of games do you play? (tick all that apply)

		Response Percent	Response Count
Sports		23.8%	5
Strategy		**71.4%**	**15**
First Person Shooter (FPS)		23.8%	5
Role Playing Game (RPG)		28.6%	6
Action-Adventure		33.3%	7
Simulation		28.6%	6
		Other (please specify)	2
		answered question	**21**
		skipped question	**31**

6. Do you use Video Games in your teaching?

		Response Percent	Response Count
Yes		22.9%	11
No		**77.1%**	**37**
		answered question	**48**
		skipped question	**4**

7. If you do not use Video Games, what are the reasons?

		Response Percent	Response Count
Do not know any educational video games		**27.1%**	**13**
Have not found any suitable video games		**27.1%**	**13**
Not allowed to use video games		0.0%	0
Unable to use video games due to hardware issues		12.5%	6
Not applicable in my subject area		14.6%	7
Do not see video games as relevant		16.7%	8
Other		22.9%	11
		Other (please specify)	8
		answered question	**48**
		skipped question	**4**

8. How valuable do you think Video Games are as a teaching aid?

	Very Valuable	Valuable	Unsure of Value	Little Value	Not at all Valuable	Rating Average	Response Count
Video Games are	2.1% (1)	31.3% (15)	**43.8% (21)**	14.6% (7)	8.3% (4)	2.96	48
					answered question		**48**
					skipped question		**4**

9. What do you think motivates Students to learn a subject? 1 as High Importance - 7 as Low Importance. You may score the same for several choices.

	1	2	3	4	5	6	7	Rating Average	Response Count
Interesting/Stimulating method of teaching	**70.8% (34)**	22.9% (11)	2.1% (1)	2.1% (1)	0.0% (0)	0.0% (0)	2.1% (1)	1.46	48
Interesting/Stimulating subject	**50.0% (24)**	31.3% (15)	12.5% (6)	2.1% (1)	2.1% (1)	0.0% (0)	2.1% (1)	1.83	48
Interesting/Stimulating teacher	**60.4% (29)**	27.1% (13)	10.4% (5)	0.0% (0)	0.0% (0)	0.0% (0)	2.1% (1)	1.60	48
Competion with themselves or others	12.5% (6)	33.3% (16)	**37.5% (18)**	8.3% (4)	6.3% (3)	2.1% (1)	0.0% (0)	2.69	48
Challenge	22.9% (11)	**35.4% (17)**	33.3% (16)	2.1% (1)	4.2% (2)	0.0% (0)	2.1% (1)	2.38	48
Grade requirement led	16.7% (8)	**41.7% (20)**	31.3% (15)	8.3% (4)	0.0% (0)	0.0% (0)	2.1% (1)	2.42	48
Vocational requirement	20.8% (10)	**35.4% (17)**	22.9% (11)	8.3% (4)	4.2% (2)	6.3% (3)	2.1% (1)	2.67	48
							answered question		**48**
							skipped question		**4**

10. I am designing an educational video game. What do you think I should focus on?

		Response Percent	Response Count
Learning Content Only		0.0%	0
Equal Fun and Learning		**66.7%**	**32**
Learning Foremost then Fun		27.1%	13
Fun Foremost then Learning		6.3%	3
	answered question		**48**
	skipped question		**4**

Page 1, Q1. Where do you teach?

1	Sixth Form College	May 28, 2012 12:49 AM
2	Hospital	May 11, 2012 4:50 AM

Page 1, Q2. What subjects do you teach?

1	ICT Computing Classical Civilisation	May 28, 2012 12:49 AM
2	Art	May 24, 2012 5:18 AM
3	All subjects	May 23, 2012 6:22 AM
4	biology technician	May 23, 2012 1:08 AM
5	Key and functional skills	May 23, 2012 1:04 AM
6	Geology, Geography & Environmental studies	May 23, 2012 1:02 AM
7	Science	May 22, 2012 4:06 PM
8	Special needs	May 21, 2012 12:58 AM
9	Special needs	May 21, 2012 12:57 AM
10	french german spanish	May 19, 2012 4:15 AM
11	MFL	May 17, 2012 9:06 AM
12	All subjects	May 17, 2012 6:07 AM
13	ICT and Computing/ Learning Support	May 17, 2012 5:32 AM
14	ICT	May 17, 2012 2:49 AM
15	IT	May 17, 2012 2:29 AM
16	Databases, networking, hardware, systems analysis and projects.	May 17, 2012 1:45 AM
17	Computer Science, Programming, Web Development (CSS & PHP)	May 17, 2012 1:08 AM
18	English, thrid in deartment.	May 16, 2012 1:45 PM
19	MFL mainly Spanish	May 16, 2012 7:51 AM
20	Art and Design	May 16, 2012 4:41 AM
21	Science	May 16, 2012 4:30 AM
22	Science	May 16, 2012 4:10 AM
23	dance	May 16, 2012 1:06 AM
24	Sc	May 16, 2012 12:15 AM
25	Maths	May 16, 2012 12:14 AM
26	Science	May 15, 2012 11:49 PM
27	PE	May 15, 2012 2:13 PM
28	langs	May 15, 2012 1:52 PM
29	Science	May 15, 2012 12:21 PM

Page 1, Q2. What subjects do you teach?

30	science	May 15, 2012 11:06 AM
31	science	May 15, 2012 10:57 AM
32	English	May 15, 2012 9:41 AM
33	Music	May 15, 2012 9:08 AM
34	English	May 15, 2012 9:01 AM
35	Technology Textiles	May 15, 2012 7:39 AM
36	Art, Child Development, I also manage the Learning Support Unit for students with social, emotional and behavioural difficulties	May 15, 2012 7:15 AM
37	English	May 15, 2012 7:11 AM
38	re	May 15, 2012 7:00 AM
39	humanities	May 15, 2012 6:57 AM
40	Business Studies ICT	May 15, 2012 6:53 AM
41	History and Geography	May 15, 2012 6:52 AM
42	Special needs (dyslexia, basic literacy and numeracy), children with Aspergers Syndrome, ASD, et al.	May 15, 2012 6:22 AM
43	RE, PHSE, Travel and Tourism, CoPE	May 15, 2012 6:20 AM
44	ICT Maths	May 15, 2012 6:14 AM
45	Business Studies ICT	May 15, 2012 6:11 AM
46	food, child development	May 14, 2012 4:13 AM
47	French	May 13, 2012 7:12 AM
48	IT	May 11, 2012 6:27 AM
49	ICT	May 11, 2012 4:54 AM
50	Nursing	May 11, 2012 4:50 AM
51	Information Technology	May 10, 2012 1:15 PM
52	ICT	May 10, 2012 12:41 PM

Page 1, Q3. At what level do you teach?

1	Level 2 to A Level	May 28, 2012 12:49 AM
2	A Level	May 24, 2012 5:18 AM
3	All levels	May 23, 2012 6:22 AM
4	dont teach support A-level btec & access	May 23, 2012 1:08 AM
5	1 - 3	May 23, 2012 1:04 AM
6	A Level (Level 3)	May 23, 2012 1:02 AM
7	year 7-10	May 22, 2012 4:06 PM
8	All years	May 21, 2012 12:58 AM
9	All years	May 21, 2012 12:57 AM
10	11- 16	May 19, 2012 4:15 AM
11	GCSE AS	May 17, 2012 9:06 AM
12	Teaching Assistant	May 17, 2012 6:07 AM
13	A Level BTEC First Diploma Foundation Degree	May 17, 2012 5:32 AM
14	L2 and L3	May 17, 2012 2:49 AM
15	2 & 3	May 17, 2012 2:29 AM
16	Level 2 First Diploma, Level 3 Extended Diploma, AS and A2.	May 17, 2012 1:45 AM
17	Level 3	May 17, 2012 1:08 AM
18	Key stage 3 and 4. Years 10 and 11 working towards GCSE English Language and English Literature.	May 16, 2012 1:45 PM
19	GCSE	May 16, 2012 7:51 AM
20	Key stage 3 and key stage 4 GCSE	May 16, 2012 4:41 AM
21	ks3 & ks4	May 16, 2012 4:30 AM
22	KS3 and KS4	May 16, 2012 4:10 AM
23	ks3 and 4	May 16, 2012 1:06 AM
24	KS3&4	May 16, 2012 12:15 AM
25	KS3/4	May 16, 2012 12:14 AM
26	KS3 and KS4	May 15, 2012 11:49 PM
27	GCSE	May 15, 2012 2:13 PM
28	ks3/4	May 15, 2012 1:52 PM

Page 1, Q3. At what level do you teach?

29	GCSE	May 15, 2012 12:21 PM
30	KS3, KS4	May 15, 2012 11:06 AM
31	gcse	May 15, 2012 10:57 AM
32	KS3/KS4	May 15, 2012 9:41 AM
33	KS3 & KS4	May 15, 2012 9:08 AM
34	11 - 16	May 15, 2012 9:01 AM
35	KS3 & GCSE	May 15, 2012 7:39 AM
36	Key Stage 3 and 4	May 15, 2012 7:15 AM
37	11_16	May 15, 2012 7:11 AM
38	ks3/4	May 15, 2012 7:00 AM
39	ks3 & ks4	May 15, 2012 6:57 AM
40	KS3 and 4 AS level	May 15, 2012 6:53 AM
41	11-16	May 15, 2012 6:52 AM
42	Key stages 3 & 4	May 15, 2012 6:22 AM
43	KS3 and KS4	May 15, 2012 6:20 AM
44	KS3 +4	May 15, 2012 6:14 AM
45	KS3 + KS4 GCSE + BTEC	May 15, 2012 6:11 AM
46	gcse btec	May 14, 2012 4:13 AM
47	A-level	May 13, 2012 7:12 AM
48	KS3, KS4 & KS5	May 11, 2012 6:27 AM
49	Level 2 and 3	May 11, 2012 4:54 AM
50	Degree Level	May 11, 2012 4:50 AM
51	Levels 1 to 3	May 10, 2012 1:15 PM
52	L2, L3	May 10, 2012 12:41 PM

Page 2, Q5. If yes, what genre of games do you play? (tick all that apply)

1	linguascope	May 19, 2012 4:19 AM

Page 2, Q5. If yes, what genre of games do you play? (tick all that apply)		
2	Angry Birds, Tetris & Plants Vrs Zombines	May 11, 2012 6:30 AM

Page 2, Q7. If you do not use Video Games, what are the reasons?		
1	A bit of tech phobia	May 16, 2012 4:44 AM
2	tend to use clips and stills from games, eg. the thermite reaction used in COD MW3 to bring down the transmitter is a practical application of thermite. Also COD4 scene 1 is set in a radioactive Chernobyl! Mostly use these for engagement rather than content.	May 16, 2012 4:34 AM
3	Also time is limited!!	May 15, 2012 11:50 PM
4	i do	May 15, 2012 6:59 AM
5	i do use programs that have games included, eg Wordshark	May 15, 2012 6:25 AM
6	no time to reseach	May 15, 2012 6:21 AM
7	already answered yes	May 15, 2012 6:16 AM
8	Of the exisiting games I could use, the game playing part is the reward, there is no learning in this process.	May 11, 2012 6:30 AM

Appendix 2: Information Sheet and Consent Form

Information sheet **Date:** __ /___/ 20__

Project Title: Is it possible to design and develop a framework that will fulfil the needs and expectations of both students and educators alike?

In accordance with the university of Worcester ethical procedures the following information is provided for you to read.
You are invited to take part in a research study which is being conducted as part of a PhD degree at the University of Worcester.

What is the purpose of this study?
This study aims to explore how video games could be designed and developed for education that could fulfil the needs and expectation of both students and educators. This part of my research aims to ascertain the views and experiences of educators and students in a Phenomenographic study of the game that has been designed and developed; how different people experience, understand or conceive the artifact in question. It is not focused directly at the artifact but at the variation of people's perception of understanding and experiencing it

Why is the study being done?
Research has shown that gamers are motivated and engaged when playing a game, however the design and development of educational games often misses the mark in capturing the essence of what actually motivates and engages the player. This study aims to understand the gap between the educators' needs and students' expectations and ascertain if it is possible to design and develop an educational game that meets both parties.

Why have I been invited to participate?
You have been invited to take part in this study because this study intends to collect your views as a practitioner in either education, as a student or a gamer.

What do I have to do?
Play the game and be interviewed about your experiences.

Do I have to take part?
It is up to you to decide whether or not to take part. If you decide to take part, you need to sign a consent form for this study. You will be free to withdraw at any time without giving a reason.
.
Will my taking part in the study be kept confidential?
The use of any information that identifies you during the course of the research will be kept strictly confidential.

Contact Details
If you would like any further information please contact:
Sherry O'Sullivan
City Campus
Worcester
Email: s.osullivan@worc.ac.uk

Consent form

Project Title: Is it possible to design and develop a framework that will fulfil the needs and expectations of both students and educators alike?

Name of Researcher: Sherry O'Sullivan

I agree to take part in the above study and am willing to have my involvement in the interview recorded.
I understand that my information will be held and processed for the following purposes:
- To be used anonymously for internal publication for a PhD project and submitted for assessment. It may also be published in academic journals / conferences at a future date.

I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason and without consequences or prejudice.

Name of Participant:
Date:
Signature:

Researcher:
Date:
Signature:

Department of Computing
University of Worcester

Appendix 3: Game Images

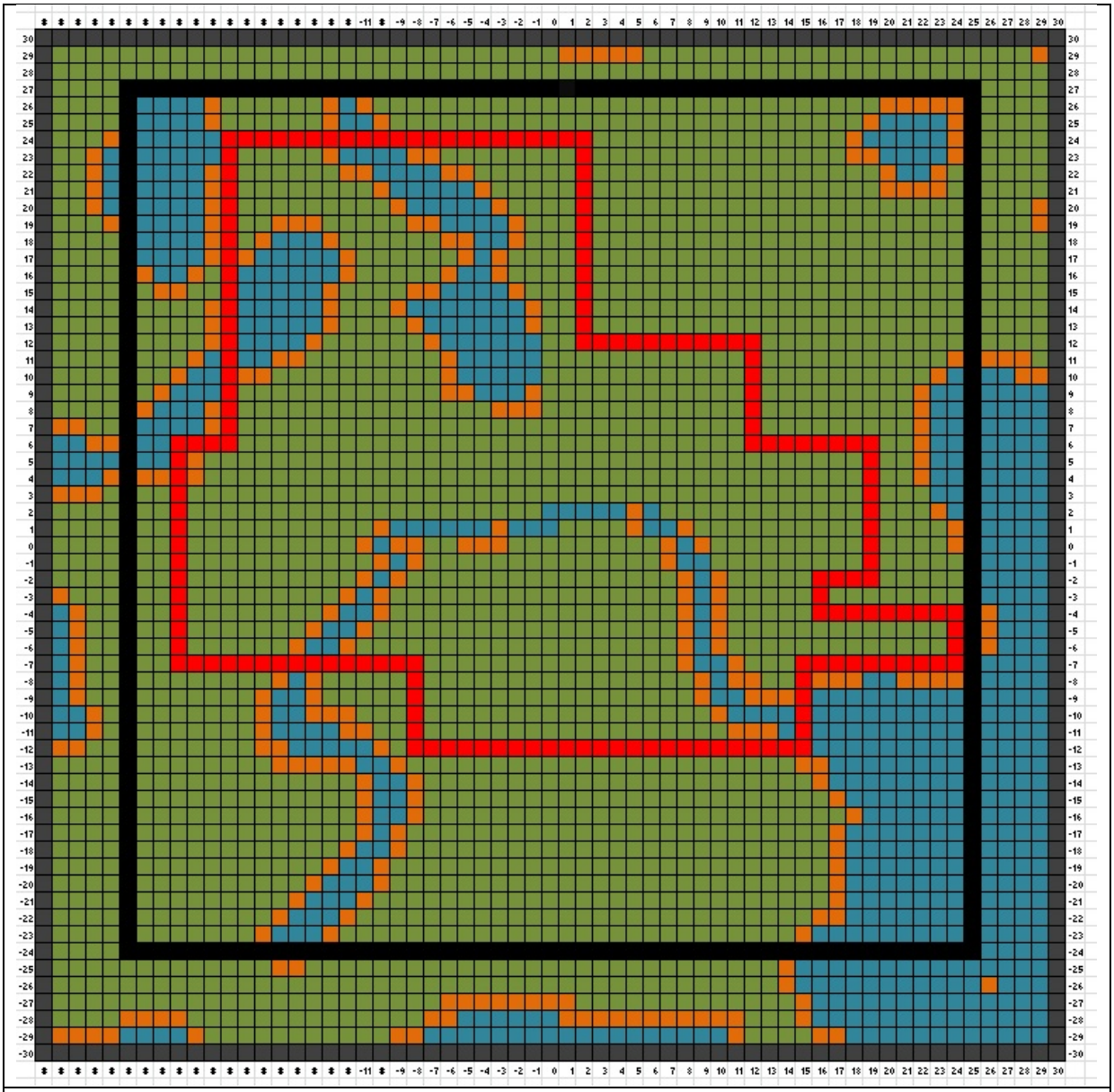
New prototype: Images of Khemia

Images show some of the design/development of final game. The initial prototype for study 1 to 3 was set in Weogorna Province. This new one for final phase of study was set in Khemia

Images from editor and in game

Started with blank canvas, A new world was generated in Fractal world explorer found in fractal mapper. This program worked better than trying to generate heightmap in Oblivion editor. The generated terrain size was 1024x1024. Once the land and water was generated to make a land mass I was happy with, I then had to ensure that the water level was lowered to the requirements of the tescs editor (4096 metres is the default water height used in the editor). This was then exported as a 16 bit binary and saved in the directory to be imported in the game for adjustments

Some of the land textures were generated by the editor, but some trees, rocks had to be hand placed. Buildings, animals, NPC, dirt roads and fencing all had to be placed by hand. Adjustments to the world had to be made, moving rocks and trees to place buildings etc. Some areas like the dirt road and land textures also had to be done by hand, especially to ensure smooth integration.



First step to map making; all co-ordinates need to map to final in game map. This must be done after the main world is completed. Excel spreadsheet was the easiest way to ensure all co-ordinates were mapped

Example of two of the generated images (FIG1)
Making the map. All areas are generated within the game and saved in 256x256 dds format. These images are then ported to Photoshop and joined together. However there is some overlapping so the actual size required for each image is 241x241. Because of the huge file, the whole map was stitched together in 4 quadrants and then theses were stitched together.
Once this was done, it was then saved as one image. There were 2652 images generated

FIG2

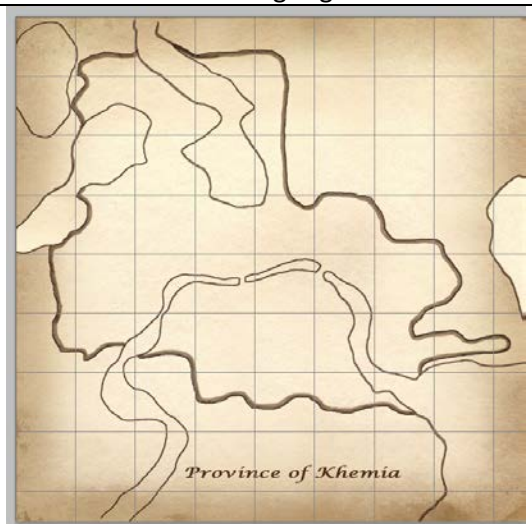


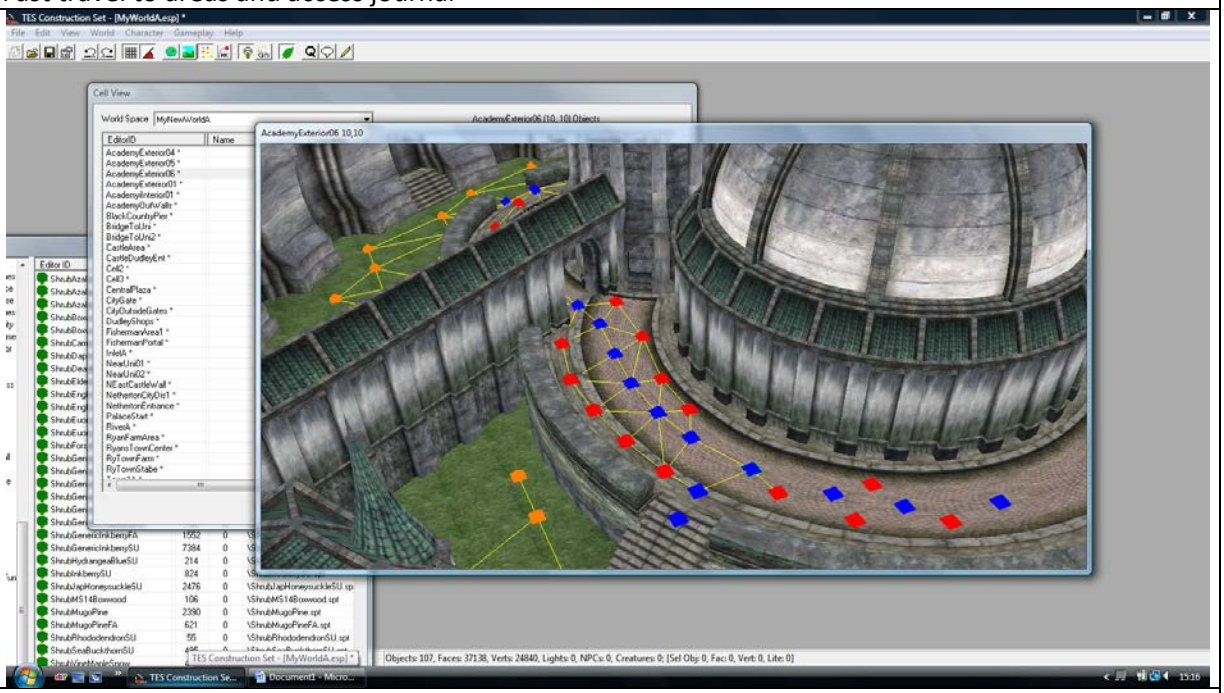
FIG3

2652 of them to be stitched (overlapped to 241X241) done in 4 quadrants (each quadrant was 6526 X 6275), then stitched together to make one map. The above FIG2 is one quadrant, each square represents an image as shown in FIG1

To make the final map, a tablet and pen was used to labouriously draw round every border(FIG3); especially the rivers to get the contours of the land mass. This has to be precise otherwise your player could end up travelling to the middle of water.

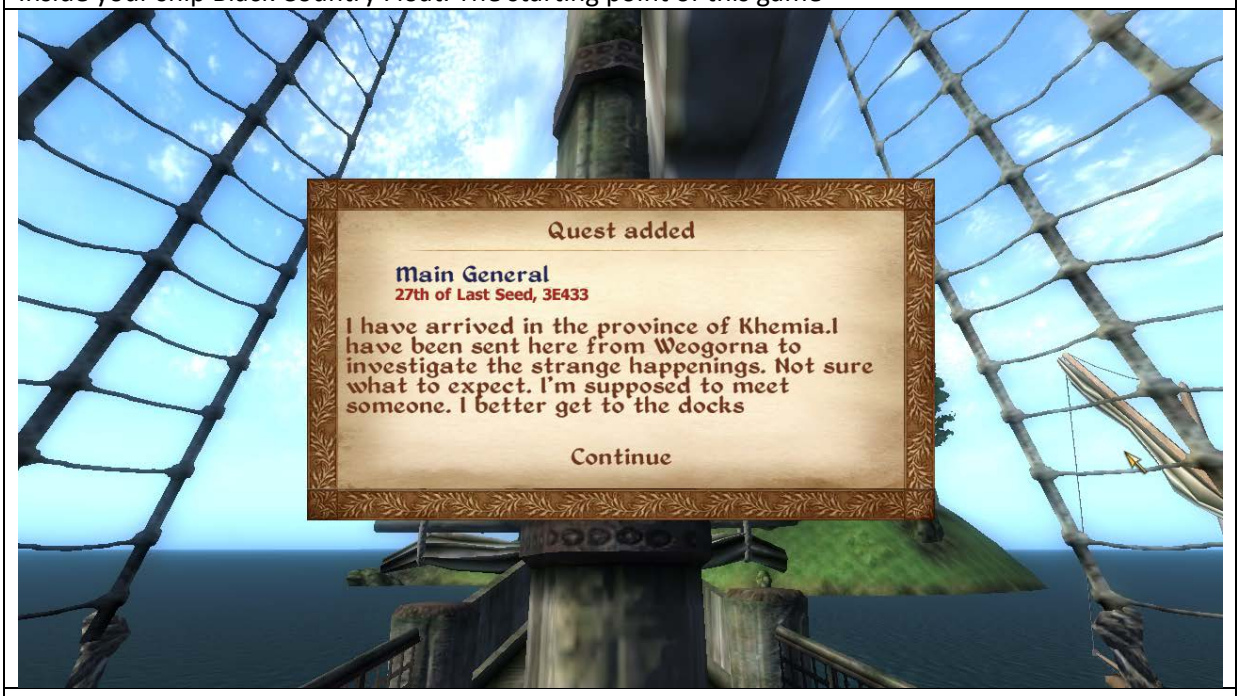
The map had to be 2048 X 2048 pixels. The co-ordinates for each area had to be exact
The final map after it was beautified using Photoshop to be used in game

Fast travel to areas and access journal



Once the world was made, the paths had to be defined for the NPC (Non Player Characters) Generating believable paths is an important aspect for the feel and experience of a game. Though some generation of the path nodes can be left up to engine, some important areas where NPCs have to travel to are done by hand. There are some areas that the engine also finds difficult to define.

Inside your ship Black Country Float. The starting point of this game



Arrival by ship to Khemia

Your ship. View from the docks

View out to sea: A ship coming in from Weogorna Civitas

The docks at Gar Darhim

Gar Darhim Lighthouse and market

Lighthouse: Lit by NPC each night and extinguished in the morning

You meet Belroth who tells you why you are here. Elements from the elemental world have been kidnapped. He tells you you need to travel to the Academy where the Arch mage will give you more details on how you can help

Belroth gives you access to your own horse and you start your travels

Port Gar Dahrim: view at night

View from the top of Eldford Keep

A scene of cottage at night, from Gar Darhim to the Alchemy Heights and Cedal town

On the way to Alchemy Heights

Rabbits in the wild

Farmer Giles at work

Farm animals

Waterfall near the farm

Watermill Cottage between Cedal Town and Khemia University by Pleasant Brook

Watermill cottage at night

View of Khemia University

A lecture at the University

Element Iodine and Calcium in Cedal Town

Cedal Town

In the dungeons of Khemia University

There are 3 main puzzles. Two chemistry (images shown) and one to label famous scientists' paintings

Solve the Chemistry puzzle

Top down view

Another dungeon: Chemistry word puzzle to solve. Find the clue to open the gates; make a word from the symbols

Appendix 4: Interview Transcripts

Game Experience

Vn870279

Q1 Experience of the Game

Me	Okay, so what did you think about the game, I know you've already said a little bit but if you could repeat it
Res	Yeah, I found the game interesting. Obviously it did have very minor bugs in it which I'm sure as it is only a prototype can be fixed. But if you were to fix them, I think it can become very successful.
Me	Do you think this kind of framework would work? To try and motivate and Engage?
Res	It's hard to say if it would work. I think if I were to take a successful company that has done this in the past such as Ubisoft, because of their game design of Assassins Creed, I think they would become successful because in making educational games because they have made the educational element in the game not a requirement to complete levels. They have made it almost a lore element on the side of the game which I think intrigues gamers to delve deeper. Well in Assassins Creed, it is History. In this one, the one that you've designed it means that the Science, the chemistry element is a requirement to pass the levels which I think is new, so I can't say if it would work or not. Obviously, I would not be as intrigued in it as a game which has become successful and that, but I do think it has potential to, you know, become successful
Me	So as an educational game, trying to follow the curriculum,(R=Yeah) which is what I was trying to do. That, you'd find that you would actually play it? Not necessarily at home but if you were doing it in class or something like that?

Res	Yeah
Me	And would you still think of it as an educational first and game second or game first, educational second, which way round?
Res	Because of its mechanics using education to progress in the game, you can't, I can't see it in any other way other than an educational game. Especially as you were saying if I were to do it in a classroom, then yes, I would have to view it as an educational game.
Me	Okay. Now what teachers want is to actually take all those other elements out and just leave the puzzles and just use those puzzles. What do you think that will do to the game?
Res	I think that would completely destroy it because, the reason, the reason why people game is because of the puzzles, they're intrigued with them, that's why they stick to the game and the way you've mixed the education and the puzzle together is very good but if they were to take out the puzzle then it would just become educational, reading off the screen which I think wouldn't be as…
Me	But what would happen in a classroom say, that you just went into that room to do a puzzle and then went into another room to do another puzzle? Do you think that would work? That is the kind of thing that they would want, take away all the world
Res	No, I don't think that would work.
Me	Why?

Res	Because you are taking away a huge aspect which makes a game a game. You can't just have consistent puzzles
Me	Okay thank you

Vn870280 **Q1 Game Experience**

Me	Okay do you play games a lot?
Res	No, not a lot,
Me	What kind of games do you play?
Res	Mainly on the Xbox, GTA. That's about it really
Me	Okay. Now what did you think of it as an educational game?
Res	I thought it was interesting. I think it took quite a long time to do things. It was a little bit frustrating not knowing where to go
Me	Yeah
Res	There was a lot of reading that had to be done, just to get from place to place, so I had to get a horse. Instead of going straight to get a horse, I had to go to a person who then took me to their house and I had to get the horse, then I had to go to the University
Me	Right, so you don't play RPGs a lot then?
Res	No, that's probably why
Me	Yes, this is an open world RPG, the whole point is that as you

	go along you would explore. Okay, so it is good for me to find views of people who don't play RPG Okay so if just puzzles were done and no exploring, would that have been better for you?
Res	For me, I think it would. Because if I needed to explore the world, I would probably need a reason to do that. For instance if I wanted to get a house or something and then put store stuff in the house and then go exploring. If I was in a school/university I would not feel the need to do that. So I don't know why I would feel the need to explore, here.
Me	So you would just want to do the puzzles
Res	I would yeah
Me	Jump from puzzle to puzzle?
Res	I would be happy to jump from puzzle to puzzle
Me	So you should be a teacher, that is what they really want I won't ask you about RPG as you don't play them. You said that you weren't interested in the immersion/world?
Res	No not really
Me	Did you take any notice of the environment, weather
Res	Actually I did notice the weather, looked up at the sky and thought it was quite nice
Me	So you did notice?
Res	Yes and the buildings and those tress that hovered, it was quite

	interesting
Me	Okay
Res	It was interesting to a point, where you had a break in between doing things. It took a while to go to different places, so you weren't constantly solving puzzles
Me	Are we slowly bringing you round to RPG
Res	But to me it still did not make sense, you had to spend a lot of time getting to places
Me	I agree the first journey was long, that was to give people time to get used to the controls especially if they had not experienced this type of game, to learn to walk, run, ride a horse etc. Okay, Anything else you want to add? It makes it difficult because you did not do the chemistry puzzle
Res	I think I'm not someone who plays games a lot. The reason that I don't play, certain games, like I played Morrowind before, but when I'm playing games like that and I know I need to do something. The trouble is I think, okay, logically I have to go here and get this. I know what I need to achieve but if I try and do that on my own, I'll skip a few steps that might be important for later on. So I'm constantly thinking, I can't just enjoy it and get immersed and go somewhere because I have to make sure I go to the right places first and talk to the right people and get the right stuff and do the right actions and sometimes if that is not obvious, it does not immerse me.
Me	Yes that is more of detriment than enjoyment, yeah. It is that

	some people do find that they lose the immersion by trying to follow or if they don't know what they are doing. Some people prefer FPS, I don't in combat I hand it over to someone else
Res	Yes for instance I kept punching stuff, it wasn't that I kept punching stuff, it was that I was trying to click on stuff. For instance I thought space bar would be to jump stuff not kick me off the horse, it's just things like that
Me	Yes and if you're not to PC it makes a difference. You can tell the difference between PC and non PC players. Okay thank you ever so much

VN870282 **Q1 Experience of the Game**

Me	Phenomenography, you know what this is.
Res	I do
Me	So what was your experience?
Res	When I first sat down to play it, I thought, I haven't got a clue I don't how to do it. I don't know what I'm doing, I don't know what I'm trying to solve. But just knowing those few controls to start with, starts you off and gets you into the game
Me	Hm okay
Res	So I don't think it matters, it didn't matter to me. As I started to play it, I thought ooh this is exciting. I don't know where I have to go, I don't know what I have to do but I know I've got to do something

Me	So, you're not actually a gamer
Res	I'm not a gamer
Me	But you still found it exciting?
Res	Yes…. I think it's quite addictive actually, because you don't know what to expect, you know, you sort of know what you have to do because I had a little bit of guidance, didn't I? About press this, press that, go and find this, go and talk to that person. Hum, so I think that's, that's the exciting bit, you don't, because you're not on the straight pathway, it's that air of discovery
Me	Yeah, so exploration, discovery
Res	Exploration, yes, yeah
Me	What did you think of the actual world? You know the scenery, landscape?
Res	In terms of realism
Me	No just in terms of experience?
Res	Okay. Hum… As I was moving through it, hum, because things sort of pop up as you go along. It makes you stop and think, do I need to go there? What's that building? Should I be looking at that? Do I need to go up that pathway, which way is the pathway taking me?
Me	Yes

Res	Is that my objective? It sort of leads you through but it's asking you questions all the time. Isn't it? That's what I thought it was doing. Even though you can go to the map and you can say, right, I'm still on this path, I'm going South West, but are these other buildings important? Should I be looking to see what they are doing? Is it part of the puzzle?
Me	That's good. Do you think you'd feel as interested in it, if it was just the rooms?
Res	No.
Me	With the puzzle, you know the room where you had the, where Brother Sother, for instance was hanging the pictures. Did you see that bit?
Res	I didn't see that bit
Me	Or the room with the floor puzzle or the pillar puzzles. If there just that and nothing else
Res	I don't think I would like that because, because you're sort of transported into it so if you were…. So if I was doing that and I was in a room all the time, I think it would make me feel quite claustrophobic actually
Me	So you wouldn't like just doing a puzzle and then doing another puzzle and another?
Res	No, no, no, the travelling is part of it. The going outside and the travelling is part of it. It, it makes you feel more absorbed, I

	think, whereas if you were just in the room… no
Me	So you think that engages you and motivates you more?
Res	Yes, because it's that where are you going next
Me	Did you think of it as an educational game, an educational tool or a game?
Res	I thought… it was difficult because I can think of things in the educational way, but as I was playing it, I didn't think about anything like that at all. I just thought, what, what are these things inside the puzzles that are going to make me interested. That's what I thought
Me	And solving, did you think, I need to solve this?
Res	Yes, I need to solve it. And so when I was doing the puzzle with the metalloids, I knew I shouldn't have stepped on the Copper, obviously, so I got that wrong. Hum, but then it was so which one is a metal and which one is a metalloid? Which ones don't I need to tread on? So it sort of transports you then from being in the game, travelling, I got to do this, I've got to there to, right, now I'm doing this puzzle. So it's a different place, I'm not explaining that very well, am I?
Me	No, no, no that's fine
Res	I'm in a different place, so you solve it and that's good and what I actually said before the interview to Brother Sother was where do I go next, and he said you've solved it. And I went oh okay, because I wanted to go somewhere else then and do another one

Me	So you wanted to carry on?
Res	Yeah, and considering I'm not a gamer then it did…it was exciting
Me	Good. I know that some teachers I've spoken to, who have done this, have said it's the travelling they don't like, the discovery, we just need it in one place. So you have, you know the puzzle and then you do something else and you have another puzzle. Different types of puzzles and that it should just be contained without running around and discovering.. would you agree with that?
Res	No I completely disagree with that because, because you do a puzzle, and then if you are going to, if you need to go somewhere else, it sort of almost gives your brain a break and it's almost like chunking that material
Me	That's a good way of putting it
Res	Because if you just go from one to another, then you're going to think oh, humph, another one and I think that would probably be a de-motivator and you would be fed quite easily. Whereas, having that break and going to travel somewhere else, then, then I think that keeps the interest. Yeah, I think the chunking of doing that is much better. So I would disagree with that
Me	Okay, thank you very much
Res	Is that it?
Me	Yes that's all I need, thank you again

VN870289

Q1 Experience of the Game

Me	What was you impression of the game, give me what you felt what you thought
Res	I thought it was very interesting. I thought that it was engaging, hum and I thought that the elements around the actual components of learning would be enough to distract people from thinking that were actually doing anything educational at all
Me	Okay. Did you like the fact, I mean you did it with RES2Other, did you like the fact that you were discussing talking, looking at the book
Res	Yes, I think that the learning was evident and that the hum the exploration was evident hum, but it was masked quite heavily by the game
Me	Okay. Now a lot of teachers have said to me that they would prefer if all those elements were just taken out and just the puzzles done. What do you think?
Res	I think if you did that, you would lose the whole purpose (laughs), of the game. I think probably where people are coming from is that if you had an hour of learning, hum, like lessons are chunked to an hour, then hum that would be quite a slow way of learning, but from what the perception is, why can't you just give people that information up front. Hum, but that's not the point, the point is someone discovering the learning and hum the bits in between are what makes the learning more engaging. So I think, what you'd find is that, that learning would stick more than if you just said "these are the metalloids, these are the people (laughs), this is them you know this is what you want to do" You could that in five minutes actually, five ten minutes

Me	Yes
Res	But it's not about that, it's about the stick ability of the learning. Hum, so the reason people are probably saying about that is probably of the constraints, that we put learning into in classrooms. Hum, this probably doesn't fall into the classroom learning but it would fall within, flip learning or blended learning. That's certainly something you would give some of the students to do outside of the classroom and then come into the classroom the next day and then you could discuss the metalloids a bit further or the scientists or whatever you wanted to do. So in terms of the future of education, that would be very, hum, that would be the kind of thing that people would need because that's the type of thing that the students would do outside of the classroom, and hum, and it's not about all the facts that they are learning, it's about the fun of finding the learning
Me	Okay. Did it disappoint you that there wasn't a test in there?
Res	No
Me	That you weren't assessing, because that's another thing that research has shown that there isn't much empirical evidence that learning does occur? Did you feel that either of you had learnt something about metalloids?
Res	Yes learning has taken place, the fact that it has not been assessed in the game as such, doesn't mean anything. The assessment… what I'm talking about is stick ability. Will the people remember "Oh, that's what I found when I when there", yes they will because they were engaged in it. It's the engagement that makes the learning stick. So it's the finding of the elements or whatever you're finding out, with the walk in between, the talking to the people, all that, that's all integral to

	actually you…it's your curiosity. It's, it's developing students' problem solving skills
Me	Do you think… This is really supposed to be meant for those who are disengaged, because those who are engaged in learning would most likely pick up a book and will find yes I can find out about this….or that, but do you think it would slightly inspire some students?
Res	Yes
Me	Why?
Res	Because they wouldn't know that they were learning
Me	So you think that's the important thing?
Res	Yes I do. Not that they would not know they are learning because they would still know it's still a thing. It's so embedded into the quest and into the game that they wouldn't actually think, this is something I've got to do, I get that, I get that done and then I can go on to the next thing. It's not that, it's just a, here you are, you found this, now go and find something else. It's a discovery for them and that's….they are not going to remember, they won't know, if you asked students afterwards, they would not be able to name all the metalloids, but they would have maybe one or two "Ah, I remember that", then that goes on, that's stick ability. I would envisage that this would be the kind of thing people would use more than once. Because they would find different things every time, they visited and then that would be stick ability and then would be… it's not just the be all and end all…
Me	No
Res	I assume it's not supposed to be that
Me	No it wasn't …
Res	But it is an enhancement to and sparking curiosity and creativity in students to actually go and explore a bit further. It may get people to go and think, oh, I wonder what that is, I've

	never heard of that before and go outside of the game and go into a book. And that's what flip learning is, it's about sparking curiosity, sparking engagement, sparking hum, knowledge.. quest for knowledge
Me	And also you could have discussions for instance, why is Davy there? We know him for the lamp
Res	Yep
Me	What relevance has he got to the elements
Res	Yes
Me	Would you consider that a learning tool or a game, still?
Res	A game
Me	Okay, thank you very much

VN870291 **Q1 Experience of the Game**

Me	Tell me what you think basically
Res	I thought the game was very good, it encourages you to look up things and learn as you go along, but it's… from I played of it, there is a lot to investigate and to look at. Hum, hum and yeah it draws you in, it's a good game
Me	Did you find it disappointing that there was a little about chemistry and science or did you just go…?
Res	Hum, no, they're basically things you have to do in any game. To get on, you have to go on a quest, you have to go and do things, so no, I thought they were good, yeah.
Me	Okay
Res	It doesn't matter what it is you have to do, it's part of the game, you know
Me	Did you feel it was a game or did you think of it oh an

	educational tool?
Res	Hum, I felt it was more, it felt like a game to be honest
Me	That's what I'm trying to achieve so that's good
Res	Yea
Me	Now a lot of teachers have said to me that they liked it but they would like the puzzles.. just the puzzles, so just the room with the puzzle and the other rooms with the puzzle and the next one and so on without all the discovery and things. Do you think that would work?
Res	Hum, I think then it would feel more like (Laughs), a just an educational tool rather than a game and because you can go and investigate other things, that may not be you know, part of the puzzle or whatever, it makes it feel more like a game really. You know it's more immersive
Me	Okay. And you think that's more important
Res	Yeah, cause its… if you play games it's what you do basically, you go around and you investigate things, you know, you find out what's in a room, whether you need anything. It's more like, yeah, it makes it more like a game.
Me	Yes that was the aim, it was good to know that aim was achieved.

Vn870274 (22/05/14)

Weogorna Civitas (what was the feeling about this)

Me	So, what did you think?
Res	I thought it was fun and (gap), it created an excitement (cough) after the, after first challenge. I could…. just observe, that my excitement level increased hmm because it was, it was , it was very it was challenging hmm, the first puzzle
Me	Did it bother you that it was an educational thing? That it was to do with Chemistry or…?

Res	No, no, no
Me	Did you even think about that, it was to do with Chemistry
Res	No, no initially I didn't, hmm. When we, when you came in, into this room with the periodic table hmm it took me awhile to, to see that and to understand that this is, vow you know, its hmm, so it felt more as if I was playing a game and less and less about periodic table
Me	Hmm Good. What about hmm, other things that you felt about the game. I know you said you liked the challenge, what else did you like?
Res	I loved the scenery, hmm the…it took me a while when I started to play in the game, it kind of draw me back to the times when I played, I used to play games and I and I… it struck me that you know, vow, this is why I… this is why (cough)I like…. loved playing games. It takes some time to get into the world but, but once you're in there hmm it's hmm you know it's hmm it's highly engaging, it's highly engaging being, being in the, in the world and just exploring, exploring and you want to know everything
Me	So you wanted to just explore and
Res	I want to, Yeah, I want to explore to know what's possible, what's possible to do. You know, test the boundaries (laugh)
Me	Because it's something new,
Res	Yes, you haven't done it before and you think oh yeah let's have a look, okay.
Me	So, do you think if I'd taken away the scenery or hadn't bothered as much with the atmosphere or the weather and things like that and I'd just had a room with the puzzle on the floor and nothing else? Would that have given you that feeling of immersion?
Res	No, no because this was (cough), hmm this was a hmm more a game. The game was, dominant, the game feeling, the game element…hmm

Me	What would you describe as a game feeling?
Res	Just… the, the world, being in the world, exploring hmm, everything, all the small little details, all the features that the character has and hmm you know the possibilities you have with the character hmm I think just, just a different, you know, setting hmm, you're walking around in this world and it's, you have the freedom I think, the freedom and the and the, you can play, you can just try and go into different doors and go into different buildings and you know, talk with people and just see
Me	Okay, brilliant
Res	It's interesting

VN870276

Weogorna Civitas (what was the feeling about this)

Me	What experience did you feel, did you have?
Res	A good experience, though I would say I got lost a few times from places to places
Me	Did you feel it was immersive enough?
Res	Yes it seemed immersive definitely
Me	Educational?
Res	That's the thing, the puzzles, they forced you to learn, but it didn't do it in a way that you hated it if that makes any sense. The puzzles were there, and you got to them and the first thing I did was the metal, metalloids thing, so I had to go and look it up so you could go and complete the puzzle which is probably a more useful way of doing it, because you are learning it, you learn those patterns, and then you use those patterns effectively.

Me	Did you object to the fact it was a learning thing, or did you not even think about that, you just thought i had to solve the puzzle, I have got to do this.
Res	To me it was more I have to solve the puzzle, to get on with the quest
Me	Yes
Res	Which I suppose, there is not a lot you can do, because most of the time you are just here to learn, so there is no reason for me to do this stuff at all because there is no fun in it for me
Me	So you found that quite fun, even though you could get frustrated at times
Res	Yes, frustrating, it's just open the book, there's the book, there's the things, done.
Me	Yes, ok. So what did you think of the world, the actual place, the environment, or did it not bother you at all?
Res	It didn't bother me, well laid out, good, nice easy to follow for the most part, the markers were pretty well so you could tell where you had to go totally easy. If you rode past somewhere you missed you could see the markers, you could find it pretty easily. (sorry hiccups)
Me	Ok, so
Res	Easy to use, aesthetically pleasing I suppose one could say
Me	So you found it aesthetically
Res	Yeah
Me	Yeah, so that's good.

VN870275

Weogorna Civitas (what was the feeling about this)

Me	Ok
Res	So everything I felt the experience. I though the puzzles were very well designed, in the sense of they were very challenging, and they made you think outside the box, and the learning made from the puzzles I thought immediately was you felt like you were going to learn the elements, you felt like you had to work out the kind of elements you needed, you felt like you were applying visual and sort of kinaesthetic learning, which then would make you learn the elements much better.
Me	Did it annoy you it was to do with chemistry at all?
Res	I generally like chemistry, so it didn't annoy me at all.
Me	Did you feel, oh this is an educational tool?
Res	I didn't really feel like I was doing anything majorly educational, it just felt like it was a challenge to do the puzzle, and I just wanted to kind of accomplish that challenge really more than anything else, but I appreciated the learning value I was getting from this. As for other experiences, I thought the scenery which is one of the reasons I play RPGs is for the scenery and the player interaction between characters. As well as to define the set rising in combat in such as Paladin for example, and for the general player and social bonding, so in terms of the movie, of the player experience, the visuals were absolutely brilliant, even without the graphical update, I felt like it was realistic. The general concept of the quest looked very well designed, and I actually enjoyed looking through the quest, it's a shame that it couldn't have started and finished, but I though the elementals looked visually amazing, so they served their purpose, you could tell they were elementals, so you looked at Hydrogen, and everyone above pretty much Year Seven knows what

	Hydrogen is, so I thought it was good in that sense.
Me	So do you think it followed more game design principles than learning tool principles?
Res	I think it followed more game design principles yes. There were quite a few learning tool principles, and it was very well done in terms of a sense of how the game play design enhanced learning which is what in my opinion educational establishments should be going more towards, they should be going more towards educational fun games, rather than just educational games that aren't really well designed. If you have game design principles essentially people are going to be more willing to learn without realising they are actually learning, and it's actually a game rather than an educational tool. I think educational tools discourage people, because they don't really want to sit studying
Me	Yes, it's a different environment isn't it really. Brilliant. So, in spite of crashes, you thought that was useful.
Res	Yes, I thought it was useful. I would play it, I'd even buy it
Me	Right

VN870277

Experience of the game

Me	What was your experience of the game
Res	It was quite fun actually. I've never really tried an educational game, with like a real sophisticated game engine like Oblivion
Me	Ok. Did you think first of all this was an educational game, or did you just think it's a game? Obviously it's just one person doing it, so it's not as professional as a game like Oblivion
Res	Well first I wasn't told what it was, so I had no idea that it was an educational game, I probably wouldn't have figured it out

	until quite some time. Also it was quite well hidden
Me	So that was ok. So what did you think of your experience as a whole within the game, besides it had a bit of education?
Res	Well, I have played Oblivion before, so I had some expectations of how it would work, and there was nothing unexpected in the mod really. Yes, it was a good experience.

Experience of the game

VN870284

Me	Okay, basically I want to know what you thought of the game as an educational tool
Res	In an educational way its good it tells you a lot about chemistry you have to it challenges you in a scientific ways. Yeah I think if people played this it would be more of an educational value to them it would boost their skill in science and mathematics and English ‘cos I notice that most of the game was converted into modern day English than what it was originally
Me	Did you think as an oblivion player did you think it followed it followed what game design principles are about like feed back
Res	Yes I think it followed that
Me	So did you think of it like ugh here’s another educational tool I would never play this
Res	Well I thought, I never really, I looked at it as an educational game but my first initial ideas before I played the game was it was going to be you’ve got to put in letters and numbers and stuff but is not its more of a just Oblivion with more of an educational puzzle which I don’t think people look forward to
Me	Yes I mean that’s how they do educational games now days isn’t it really, I tried to avoid that. One of the other questions

	that I wanted to ask you was un as an RPG player and specifically a war RPG player, research all my research that I have looked at has shown that there are only 4 types of players that you've got things like explorers, killers etc etc, what kind of player would you consider yourself? I noticed that you looked around and you..
Res	I like to look around and enjoy what the makers have put into the game rather than most people who aren't very used to RPG and more of an FPS they like to go straight for the objects and don't like to observe what the developers have added it. What I observed with you game that you've changed a lot of it to the point that people will play it and also learn an educational value from it but they'll like to play it anyway because it comes off an RPG

VN870285

Res1	I'm James from Year 10 and I'm a gamer. I like the concept I think its good but I don't think it would work for people who are non gamers because they might not get the drift and like veer off and get bored with it and as a tool to encourage people to do work and learn I think it would really work it just needs a bit more you know to bulk it up a bit perhaps a few more tips and clues on where to go
Me	Okay
Res2	I'm Steve, Do you need my age?
Me	No, how long have you been gaming?
Res2	Probably more than 20 years on and off which so that gives my age away. Just from the bit I saw I thought it was quite good and I think for the people it would be aimed at someone who's currently studying that subject for example then I think that would work really well. Obviously not being a current student at

	the moment you know it was quite difficult for me to think of things I haven't done for a while but I think that..
Me	Did you find that challenging though or did you think oh I am trying to learn something I really don't want to learn or did you think I've got to do this in order to solve it
Res2	No I think it was good it was a typical gaming kind of challenge so it was like the puzzle was there and it was presented in the way it was familiar as a game so that worked well it was just that the subject matter was something that I wasn't familiar with the Chemistry for example and the periodic table I don't recall because it is something that I don't have to use whereas as a student who would be required to know that information its something they're being actively taught I think it would be excellent because it would be definitely calling on their knowledge and they would have to use it so yeah I thought it was really good.

VN870287

Me	Right, OK. My first question is what did you think of the game as an educational game?
Res	As an educational game in what way? In terms of learning something?
Me	No, no, just as a game that might educate somebody, that might introduce them to a subject, or might interest them, or might intrigue them
Res	Mmmmm
Me	Did you think there was enough game elements to puzzle, considering it's only a small prototype?
Res	Oh yes, that's the thing, it has such isolated incidents, as a

	proper set, you do the puzzle and then you go wander off for a long, long time, seemingly not doing much of anything, and not necessarily game elements, so like you wander along, but normally in a game you might have thieves or something, some such side quest interaction, which wasn't in there.
Me	Yes, so did you for instance…yes I think the reason for that was just to try and focus the actual elements really. I did take on board your thing of first quest for instance and put some more people in to fight, however the road thing, you can't have fighting on the road, not unless they're skeletons.
Res	What about the wildlife. Like mountain cats and things?
Me	That was a no-no with teachers.
Res	Really?
Me	Yes.
Res	Oh, that's a shame.
Me	That is an issue, that's why I had to take the cats out.
Res	(Laughs)
Me	Yes, anything that fights.
Res	Well that takes a lot of the game out of it.
Me	Yes it does, but it's trying to do something that is suitable without being violent, and they would consider that as a violent thing, so you can't do a cat or something like that in an educational setting. So if those elements were in, and they could play it out of a school environment would that be ok?
Res	Yes.
Me	But did you find the puzzles were challenging enough?
Res	Oh yes.
Me	Yes you did.
Res	Once I found, well the difficulty was knowing that there was that book next to...well I remember that elements game, the metalloids I think it was.
Me	The metalloids yes.
Res	Yes and it took me a while just to find the clue scroll, lying on

	the floor as to what you actually had to do, would have helped if I had found that first, and then of course what are metalloids and you think maybe they are something in the game, and you start wandering around looking for a scroll or something with hints on it, and I couldn't find it, so yes that was challenging certainly.
Me	Do you think it would have been too easy if I had given the clues already in the game?
Res	No, I don't think it would have, because the clues wouldn't necessarily be things they would have to come across, they might just be there in the background, they might solve them whilst going around in that world.
Me	Ok. The idea of having the book outside was, and a few students did do that, where they actually looked at the book and talked to each other and things like that. If you had somebody else with you who had done chemistry and things, would you have talked to them, and said what is, is that your normal way of doing it?
Res	Normal way of doing what?
Me	Of playing a game, if you had somebody else with you.
Res	Well I don't normally play with other people.
Me	You would normally just play by yourself?
Res	Yes.
Me	Ok.
Res	I guess the thing on having more invention in some games like an RPG, you go online to find information for an RPG, so for example in Oblivion there are various types of weapons and I will go online to find out what the best weapon is, how I acquire it in a quest etc, so I will go to external sources in that way.
Me	I mean I know you said the first part was quite long, with a long road, but you could have actually on the map, I had actually put the opportunity for you to fast travel.
Res	Oh right, I thought you had to reach the location before you

	could fast travel.
Me	No, for that I had done that already. I mean I didn't say as I didn't watch you play that bit. With other people I had done that. Ok. So what did you, I know you as a proper gamer you were thinking "I want it to be more game like", but we are talking about an educational game so therefore there is a slight difference, do you think that's more of an educational tool, or an educational game?
Res	Your approach type?
Me	Yes.
Res	Mmm. (Long pause) More of an educational game I think.
Me	You think it's more towards the gaming side?
Res	Yes.
Me	Ok.
Res	Because you have got your puzzles and things if you like, those could be tools, but for the fact everything is linked up in one cohesive world, and there's stuff to do outside of that, as well as the puzzles
Me	I mean obviously, as I have already stated, this is just a prototype, but if it had been developed properly there would have been much more interaction outside, and you would have done different things. There were other things to do that I didn't bother linking up because of time, and that was my concern, like the one you probably saw with the Dewdrop Inn, where you do 'The Sauce', where you find out about sauce
Res	No
Me	No, you haven't seen that, ok, and that had nothing to do with education, but I didn't include that in as I had already tested that previously. Ok. So what do you think of it if I removed all the external, which I noticed you were a true gamer in the sense that you just went boom, boom, boom, but you didn't actually, it surprised me, that as an RPG player you didn't actually look around.

Res	Well part of that is because I'd played Oblivion extensively before, so I'm quite familiar with what sort of things there are in that game world.
Me	But I had put different things in
Res	Oh you had put extra things in
Me	But you didn't go to the farm animals, the farm yard or any of those or notice those. So there were different elements in there that you didn't even notice, which surprised me, was that because your assumption was, it's just going to be like Oblivion?
Res	Yes, pretty much.
Me	So perhaps that's the perception. Ok, what do you think of it, which is what teachers want to do, if I removed the whole world, and just had the puzzles? Nothing else.
Res	You could do that yes.
Me	And do you think that would work as a game?
Res	No, it's not a game. (Laughs)
Me	Why not?
Res	For me, a game has got to link up. So if you have got an isolated set of puzzles, it's an isolated set of puzzles, it's not a game.
Me	Ok.
Res	There has to be some sort of cohesive thing or element that contains everything.
Me	This was what was said for instance by …. and other people, they went, well just remove everything else, and just have the rooms and puzzles.
Res	Yes, it's not a game.
Me	So, going back to the educational thing, because they want isolated quests, and things like that, if you had something like Mass Effect where you had to go to that to gain more points, would that work?
Res	Potentially yes, you could have some sort of loop based

	system. A lot of games I've played you have the idea of grinding towards something which means taking part in an activity you're not particularly keen on doing, but you'll do it over and over again just because you know a nice fancy sword or something else at the end.
Me	So you think that would work?
Res	Yes, you could put educational content in there, being the grinding thing that has to be done to get…
Me	To get the extra things. And then that would please the teachers, and please the students as well.
Me	Ok. Anything else to add?
Res	I don't think so.
Me	Ok, wonderful, thank you very much.

VN870328

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Me	Ok, I know you are not a gamer, but what did you feel about the feel of the game. Did you think it was an educational learning tool, or did you think of it as a game?
Res	Probably more as a game because it took quite a while, there was a lot of exploration to get to the actual learning bits of it.
Me	Tell me a little bit about your experience of it. This is the second time you've had a little exploration of it.
Res	Mmmh
Me	So tell me about both of the experiences, what you felt, what you experienced, what your views were on the whole

	experience.
Res	Mmm. (Long pause) I'm sorry because I don't play games, but I've watched a lot of people play them so…(long pause) I don't know, again I enjoyed the outside bit, I really enjoyed being on the horses. (Laughs) That's because I have a background with horses, and I like the animals, and I like the outside.
Me	Ok. A lot of teachers think all that should be removed, and only the puzzles should be left. Do you think that would work?
Res	I suppose it depends on how much time you have. If you have three hour class, that will work beautifully, but if you are really strapped for time, I don't know how that would work in a room full of students, probably quicker with pairs.
Me	Yes it would be something that could be played with.
Res	Yes, I could definitely see it as a pair. A process.
Me	Yes, this is what we have done in the study; most people have played in pairs. That's what's happened, and they have discussed things with each other. Ok, anything else to add?
Res	I like the music, but after a while it gets…I find it hard to concentrate with music, and I'm not much of a multi-tasker, so I would probably have to turn the music off if I really wanted to concentrate and learn, learn what was going on, because I just find it distracting, but that's me, I find music in the background distracting.
Me	You can actually turn the music off if you wanted to, so that would be optional.
Res	I would probably do that.

Me	And you mentioned as well while you were playing that you didn't like the fighting at all.
Res	No.
Me	That's ok.
Res	I mean it's just an ethical choice isn't it.
Me	Yes, I mean I don't like fighting personally, but it's something the students liked.
Res	Yes I know, but they are not always right, and they're being you know immersed in a culture of violence so I have pretty strong thoughts about not supporting that.
Me	I mean one of the issues that we did, one of the constraints I put in, was they couldn't fight outside, and when they fought in the dungeons, it was only skeletons and rats, there was no human fighting.
Res	Well that's good, but still feels the same, for me it just doesn't feel right, you know slicing up rats. But again I suppose there is that balance to strike with engaging children, but I don't think it's right, it's just me, it's my preference.
Me	Yes, I know, I totally agree, I don't like fighting myself, but it was just a balance.
Res	I think students need to be guided, even if they prefer to have lots of fighting, that doesn't make it right, you know what I mean? It doesn't make it a good thing to have, maybe they would have wanted to have a lot of sex in it too, you wouldn't put a lot of sex in it though, but people seem to be ok with violence, I don't know.
Me	Ok. Puzzle wise, did you find that frustrating?
Res	YES. But I find puzzles, I'm not a puzzle person, I find puzzles frustrating, and I did as a kid too. I don't like learning that way.
Me	What about the portrait one?
Res	Yeah, that was ok, I didn't feel as stressed, I could, I felt that was better I suppose, less frustrating.

Me	Are there any other methods that you think could be used in this?
Res	Mmm, I just, (long pause) I don't like penalties, so I think the one, the last one where you had to pick the metals and pull the lever and go back, and pull the lever. That kind of thing drives me crazy, but again that's just me, people might find that challenging, but for me, I would rather have, just be able to like click on one and find out if it's right more quickly.
Me	So you want more…
Res	More chances maybe, more chances to fail, to learn it, other than having to go back and pull it, like after five I'm finished. I don't know, maybe the feedback needed to be more direct, maybe, it's an idea.
Me	Ok, but when, did you find the book outside useful, the actual thirty elements, did you have a look at that?
Res	I did, but I kind of feel that I'm in the environment I should have everything I need there.
Me	Ok. One or two people have said that, but most people have actually enjoyed the blended learning feel to it, because this is what would happen in the real, if you play a game you would go outside of the game and discover things, no? You didn't agree with that?
Res	Hmm?
Me	You didn't agree with the fact that most people when they play games do actually go outside
Res	Oh I know they do, yes I know, most gamers use cheat sheets.
Me	Yes, but you would have preferred everything to be in there?
Res	Yes. I suppose getting used to the game and knowing where everything was, yes I would have to see something come up on screen, the page of the elements so I could learn, while I was still in the environment, it's like suspension of disbelief, for me it

	breaks the immersion.
Me	There was a periodic table in the book.
Res	Mmh. Like I said I didn't want to come out of the environment, once I'm in it, I'm in it.
Me	Yes, but it was in the game.
Res	Oh, was it?
Me	Yes
Res	Where?
Me	In the actual book.
Res	Ok, I didn't know that.
Me	There was a picture of the periodic table with all the elements in it.
Res	Mmm. Ok. But I had all the other elements in blue that you were showing in the book.
Me	Yes it had all the elements in.
Res	Ok
Me	And it was colour coded as well.
Res	Obviously I couldn't find my resources well enough.
Me	It was in the book you looked at, but I think probably you just clicked off it, rather than carrying on looking inside it.
Res	Yeah, I think the user feedback in terms of the experience with the scroll, you know you say this is for people who are familiar with games, I think there's quite are a lot of assumptions about what people are going to notice if you scroll down, there needed to be something there, because I didn't necessarily know there was more information further down, without some sort of micro interaction.
Me	Yes. The original does have all the tutorial at the beginning, which I did say we cut out because it would have taken half an hour to an hour to have gone through the whole tutorial, and you build your own character and everything as well.
Res	Mmm.
Me	Which is what people would do to understand to use…

Res	Well I suppose you could also just have what a lot of sites do online, they have a product, they do a quick video, about initially to give you a quick intensive kind of thing.
ME	Yes. Ok. Anything else to add?
Res	No. It seems huge. (Laughs) Seems like big world.
Me	It is.

VN870329 (Continuation of above)

Res	Yes, I definitely did.
Me	Did you feel immersion?
Res	I definitely did feel immersed. Not completely obviously. I know I'm on a screen, but I felt more in a mood than immersion, I'm more engaged but to break the story by putting a physical copy of a book next to me, for me that's, just didn't fit, somehow I wanted to stay in the world
Me	That is odd, because you are only the second person to say that, the other person is a true hard-core gamer
Res	Hmmm
Me	And yet you're not a gamer.
Res	But I'm very visual, I'm highly visual.
Me	It's very good that you both came up with that. So yes that's good.
Res	Yes.

VN870330: **The game environment**

Me	So what did you think of the game?
Res	Well I'm a big fan of RPG's and Oblivion and Skyrim in particular, so I enjoyed the way you had modded it to your needs.
Me	Did you think it came across as a game or, as an educational tool?
Res	I think there was a nice balance between the two. I think it's very difficult to fit everything into what is in effect a prototype stroke demo. I felt there were enough gaming elements to engage people, allied with interesting and challenging puzzles to give it the educational content.
Me	So do you think this sort of framework could work?
Res	I think it could yes. As I said this is only a demo, with the resources that Bethesda could devote to it, I'm sure it could be made into a full downloadable content add on to Oblivion with lots of educational content.
Me	You said there was a nice balance between the gaming and educational side of things. It has been suggested that you could just have the puzzles on their own. How would you respond to that?
Res	I don't think that would work. It would no longer be a game. An RPG is all about the sense of immersion you get, about the story, about the characters and how your actions affect the outcome within the narrative. You complete quests and puzzles to progress within the game. If I only want to do puzzles then I can just get a puzzle book, or watch things like Only Connect on BBC2.
Me	You played the chemistry quest. You had a book on the elements beside you even though there was a book within the game. Did you use it and did you find it useful?
Res	I liked the fact that I could get more information from the 'real' book. What's the term when you find one bit of information and

	then go looking for other things relating to it?
Me	Do you mean tangential learning?
Res	Yes, that's it, tangential learning. Having a book within the game is ok, but there is a limit to the amount of information you can get from it. I like the idea of a game that encourages you to seek out further knowledge and information on a subject.
Me	Did you find the puzzles challenging?
Res	As I never really liked chemistry, yes. But not impossible. You know playing these sorts of games that there are usually clues to find, so even though I did have a real book, I guessed there would be something within the world that would help to work out the answers.
Me	You mentioned immersion. Did you get a feeling of immersion playing, and if so what caused it.
Res	I did yes. It probably helped that having played Oblivion, the whole thing had a familiar feel to it. The only problem I had was that I'm more of a console player, so using PC commands I found a bit hard going. I think it's that familiarity with that world environment that makes it easy to get immersed in it.
Me	There is an argument that there should not be any fighting in the game to make it suitable for children and the classroom.
Res	But that would take away one of the fundamental aspects of an RPG. There has to be the challenge of progressing against the odds so to speak. Plus there is no reason for this to be limited to a specific age group is there. You could I assume tailor the puzzles to different age groups where fighting would be less of an issue.
	That is possible yes. Ok, thanks for that.