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Developing a pilot methodology for the design and development of game-based intervention approaches

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Developing a Pilot Methodology for the Design and Development of Game-Based Intervention Approaches.

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Serious Games Institute

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Candidate Statement

I certify that research work titled “Developing a Pilot Methodology for the Design and Development of Game-Based Intervention Approaches.” is my own work. The work has not been presented elsewhere for assessment. Where material has been used from other sources it has been properly acknowledged / referred.

The research presented in this thesis is part of a cooperative project with the Serious Games Institute, Coventry University and SASH health interventions applied research center, Coventry University. As the lead designer on this project my individual contribution to this research is found in the design and development based decisions in PR:EPARe. In this thesis I present an original contribution of a new preliminary methodology entitled DeLHTA, and present key considerations for future game-based health interventions based on the developments and analysis of the PR:EPARe evaluation.

Abstract

A comprehensive guide in relationship and sex education (RSE) is necessary to ensure adolescents are equipped with necessary skills in order to make well informed decisions when entering into relationships and sexual relations. However, research indicates that educationalists attempting to convey these principles through didactic methods are finding difficulties engaging in meaningful discussion with their students, whether it be due to lack of training, motivation or engagement of the subject matter. Research into blended learning interventions such as game based learning has shown promise in delivering a viable and cost effective solution in this area whilst helping to promote open discussion amongst teachers and students in the classroom. To address the need for a new approach to delivering RSE, a serious game titled PR:EPARe (Positive Relationships: Eliminating Coercion and Pressure in Adolescent Relationships), developed by the Serious Games Institute (SGI) and Coventry University group, Studies in Adolescent Sexual Health (SASH) is proposed in an effort to assist the delivery of RSE concerning the topic of sexual and peer coercion to young people aged 13 to 14. The adoption of using a game based learning device developed from prior research carried out by the SASH group informs the choices taken for the context and learning objectives set out to be achieved by PR:EPARe.

The ideal methodology of serious games design and development is an area greatly contested by researchers with various theories including frameworks, models and methods available on the supreme way to aid development of game-based learning applications. Within the fray of these collected works, often reflections of similar features in serious games arise such as themes concerning pedagogy, visual design and technology. This thesis explores three of these methods of developing games and intervention methods for the development purpose of the game PR:EPARe. This research attempts to present a unified preliminary methodology for future evaluation as its main research contribution (please see Introduction, Chapter 1 for more information). The researcher draws conclusions and similarities from each of the three methodologies and as the lead designer (see Introduction, Chapter 1 for explanation) adopts these aspects into the development process of the PR:EPARe game. Finally the researcher presents a reflective analysis of the evaluation data, (evaluation designed and conducted

by SASH) and presents conclusions on development methods adopted in the process of the PR:EPARe game that have shown positive results. These are gathered to form a unified methodology for further evaluation in future works.

As the research and development of PR:EPARe was conducted in collaboration with SASH and the SGI it must be made clear the role of the researcher in light of this research and the original contribution made. A full explanation of the role that the researcher (contributor of thesis) adopted: lead designer and the researcher's contribution can be found in the Introduction, Chapter 1, and Section 1.5.

To address the overall aim and the objectives of this research, presented in this thesis is a reflective analysis conducted by the lead designer on the project PR:EPARe, a game based intervention approach conducted to tackle the topic of sexual coercion. This research is conducted from a game research and design perspective, documenting the development of the game and the process of applying user and pedagogic theories alongside game and intervention techniques.

To begin, the research will present a comparative analysis of three development methods/frameworks that were central in the making of the game PR:EPARe. The three methods/frameworks: Bartholomew's Intervention Mapping approach [1], Hunicke et al's Mechanics, Dynamics and Aesthetics Model [2] and De Freitas and Jarvis's Four-Dimensional framework [3] were chosen through an extensive literary review conducted by the researcher of this thesis, the SGI and SASH. The researcher employed the use of the 4DF and the MDA frameworks whilst SASH developed the approaches outlined in the IM framework. Prior research conducted by SASH concerning the IM approach to develop PR:EPARe was used by the researcher in order to support and produce informed R&D decisions throughout the project. A comparison is drawn between each of the methods/frameworks linking the main corresponding themes that were used in the production of PR:EPARe. The overall aim of this research is to present a unified version of the methods/frameworks through a reflective analysis of the evaluation of PR:EPARe, amalgamating assessment, design, pedagogy and evaluation to present a new methodology to aid in future development of health based serious games.

To achieve this, an examination of the quantitative and qualitative data taken from the pilot evaluation of PR:EPARe is analysed to identify the key development methods found to have a positive impact within the project. These methods are then used to construct a new methodology that can be evaluated in future work and used to aid in future game-based health intervention planning. Based on these preliminary findings, the approach adapted to the development methodology and frameworks employed, is shown to lead to a developed game which is well-received by students, offering the potential to provide a valuable resource for teachers attempting to address this difficult subject within a classroom-based context.

Acknowledgements

Foremost I would like to acknowledge the contributing institutions that made the research project PR:EPARe possible, the Serious Games Institute, Coventry University and the SASH health intervention centre, Coventry University.

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1 Introduction

This thesis presents a contribution to the area of serious games design and development through practical application of techniques and methodologies gathered from current research. It is the researchers intention that through an reflective evaluation of the R&D methods used in the SASH project PR:EPARe, positive methods will be identified and linked for further evaluation and construction of a new methodology to serious games design.

1.1 Serious Games

Research into the field of games, computers and education have seen an increasing interest in the application of e-learning in preference to didactic approaches used to aid social benefit, issues, and change. Computerized assistive applications that borrow from game technologies and methodologies, referred to largely as serious games, have adapted this approach of information delivery to a spectrum of sectors, including that of healthcare and educational programmes. The increasing exposure of applied technological research into game based devices for social benefit has gained variegated levels of acceptance amongst those practitioners and users within these sectors. Pedagogically driven digital games or serious games have risen in popularity following the success generated from the entertainment games sector. Research following the increasing popularity of casual gaming within the general population over the last decade, has shown that 74% of young people (aged 12 to 23) now refer to themselves as gamers with a ratio of 45% female to 55% male player profile [4]. As a result, researchers and developers looking to capitalise on the motivational qualities of entertainment games are developing techniques to imbed pedagogic theory into games and game based technologies, in order to create educational material suitable for a digital generation. Pedagogic games have since developed throughout many disciplinary avenues in order to challenge all manner of problematic subject matter including the area of relationship and sex education for young people.

1.2 Developing a Serious Game for Relationship & Emotional Needs

Serious games that are developed in response to the educational needs of delivering sexual health facts often lend themselves to delivering information concerning the

physical aspects of sex such as sexually transmitted disease (STD) or pregnancy, rather than information concerning the emotional state or guidance concerning healthy relationship development. An example of this can be found in Channel Four's 'Privates' game, a case of e-learning targeting the delivery of information concerning STDs and the promotion of safer sex. Whilst these areas of relationship and sexual health education are important areas to address, there is research to suggest that young people require more guidance in the emotional context of sex and relationship advice than what they are receiving from their personal, social and health education (PSHE) in schools. To address the need for development in this area, the research project titled PR:EPARe (Positive Relationships: Eliminating Coercion and Pressure in Adolescent Relationships), a sex education game targeting the topic of both peer and sexual coercion was commissioned in an effort to harness e-learning as a positive resolution to this problem. Developed by Coventry University's Studies in Adolescent Sexual Health (SASH) group and the Serious Games Institute (SGI), the project combined cross-disciplinary researchers, developers and focus groups in an effort to create a meaningful and innovative approach to delivering quality relationship and sex education to young people, aged 13 to 14 across the Coventry and Warwickshire area. The project PR:EPARe developed following research carried out by the SASH group, who adopted an Intervention Mapping (IM) approach to identify and develop a suitable PSHE resource through the medium of digital game based learning.

1.3 Issues in Serious Games Design & Development

There are many theories, methods and frameworks in the current field of serious games to aid design and development such as the 4DF [3], Triadic Games Design [5] & the Design, Play, and Experience Framework, [6] that provide instructions and emphasise key points to consider when undertaking a serious games project. Whilst these guides offer fair advice, they are often biased towards the educational and technological demands of serious games development, with the researchers often originating from these research fields. If play is mentioned such as in the Triadic Games Design method [5], it offers a list of considerations under the heading to include aspects such as gameplay, but offers vague advice on how to achieve this in development. In order to deliver serious games that the targeted users will want to interact with, it is essential to

achieve balance in all aspects of serious games design by not focusing on a singular aspect in the R&D cycle.

Additionally in the light of the research conducted for the development of PR:EPARe it is clear that little to no research exists to aid serious games for health intervention purposes. If serious games are to be adopted for health intervention purposes then a suitable methodology must be researched to feed into the process of intervention based serious games development. This is addressed in this research for the development purposes of the SASH game PR:EPARe, and is later discussed in the DeLHTA methodology outlined in Chapter 7 for further considerations in this area.

The problem that the researcher addresses throughout this thesis is to find the balance of R&D methodologies used in current educational games, entertainment games and health intervention approaches in order to create equilibrium in a serious game. Without equilibrium for example, not enough play/game qualities or lack of educational material, a serious game could fail at achieving its overall goal and thus wasting potential advances in this field. The intentions of this thesis are to show the design and development process from a games designer perspective which will attempt to show how to balance methods together when developing a serious game.

1.4 Objectives and Aims of the Research

The main contribution of this work is to produce a comprehensive R&D methodology from the development process of PR:EPARe, that unifies entertainment and serious games design with intervention methods for further adoption and evaluation. The researcher anticipates that further evaluation of the methodology produced from this initial research is undertaken and will be accepted to aid development of future health and educational game-based interventions.

Secondary objectives of this research are to;

- Provide an analysis of the chosen frameworks and methods to identify key theories to be used in the R&D research project PR:EPARe.
- To provide an account of the R&D of the research project PR:EPARe in order to provide supportive methods for future evaluation.

- To analyse the quantitative and qualitative data of the evaluation prepared by SASH of PR:EPARe against the development decisions in order to present the correlative positive themes and develop the finalised methodology.

- To develop methods that complement user experiences, and which also consider the facilitators needs.

The overall aim and objectives presented here will provide a unique contribution in the field of serious games design and development by addressing the adoption of a cross-combination method that fuses methods from entertainment games, serious games and intervention approaches together for future evaluation. Within this main contribution, questions into facilitator user design and experience are examined alongside the student user experience to present a unique view on the meaning of 'target user' in serious games.

1.5 Researchers Role of Lead Designer

My role in the PR:EPARe project was to act as the lead game designer. A lead designer is responsible for working with the projects senior management team, including researchers and stakeholders in this instance, to create, define and shape the overall vision of the game/project as well as guide the creative and production direction needed to achieve this. Other key responsibilities are given in this role to ensuring that the design demands are met on time and to schedule in a cost effective and high quality manner.

In regards to my contribution to the PR:EPARe project, I was responsible for developing the game play/game mechanics, aesthetics and sound content and oversaw the practical development of the game. It was my responsibility for incorporating the research objectives developed by SASH into a suitable game based environment that achieved the programmes overall goals, and to maintain the production process of the game. This maintenance included all correspondence with the programming team in Singapore and all iterative development work through beta testing.

The practical development of PR:EPARe leads the way to the contribution of this thesis. Faced with the challenges of developing a serious game, three methods/frameworks were chosen, one to address each area, entertainment games, serious games and health

interventions that were relevant to the design of PR:EPARe. This was conducted in an effort to develop a more complete guide to developing an intervention approach in a serious game. The study of the three methods/frameworks recorded in this thesis were used in the development of the PR:EPARe game. A reflective analysis was then undertaken by the researcher on the evaluation data of PR:EPARe to form preliminary conclusions as to the efficiency of the development methods taken. The overall contribution of the researcher is the documentation of the development methods taken in the production of PR:EPARe following the study of the three methods. The outcomes produced from the initial user evaluation, developed and carried out by SASH are compared to the games development methods taken and seemingly positive resulting methods are put forward to form the groundwork to a new methodology that incorporates entertainment games, serious games and health intervention techniques for future consideration.

1.6 A Gameplay Account of PR:EPARe

The overall design of the PR:EPARe game was split into two sections that present two very different styles of game play through an observation role in part one and role-play in part two. This was developed in order to consider different learning styles that related to the proposed objectives created by SASH. Each section incorporated content recommendations, including sexual coercion and peer pressure issues that were taken from a need assessment carried out by SASH before development commenced. The games aesthetic design developed by the lead designer, adopted a cross-combination of low-poly 3D and 2D graphics alongside that of an audio based narrative system within the game. This approach was taken to maximize the efficiency of the production value versus the running capability of the game on platforms with differing technical specifications. The Unity engine presents a choice of resolution options to the user at the beginning of each game, allowing for a greater control over the quality in which the game is played. This option provided support for a broader range of hardware platforms and improves the potential reach of the game. The lead designer concentrated on developing the fidelity of the narrative in the game rather than the visual aspects. This was essential to achieving a greater impression and thus improving motivation within the target audience, since a game based on visual fidelity was unachievable with the given resources. As a result the game benefits from a wholly character scripted

environment with characters played by local young adults which formed part of our target audiences.

In part one of the PR:EPARe game, a game show set in 3D is presented to the users. Two 3D host characters are introduced and set the pace for the entirety of the game. Within part one, the host characters present a set of different scenarios to the users and ask them to vote on whether they agree or disagree that they have been presented an example of sexual coercion. After each vote has been made the players are awarded game points dependant of the answer given and relevant information is given by the host characters concerning the shown scene. The objective of part one is to create a competitive environment between the users to think about the topic carefully and to engage in a discussion to come to a consensus. 2D art is used to show the scenarios on a 3D video screen, creating the impression of a game show environment. Throughout part one the user retains a third person view of the game. Part one of the game is intended to draw on discussions between the user and the facilitator and to open the way to understanding the complex issues faced with coercion.

In part two of PR:EPARe the game focuses on a role-play approach to deliver the educational content. In this section the user is presented with two scenarios that have changeable outcomes, one for a coerced situation and one that addresses the coerce role. They are first shown the negative outcome of the scenario and are then expected to play through and change the outcome to a positive situation. The scenarios in part two are all 3D and are conducted through a first person view. The scenarios present two characters which could be male or female through a random generator, and users can choose how they answer questions through a type box which will lead to changeable outcomes. Part two of PR:EPARe is designed to give the users a more personal feel to the characters and the situations that are being offered and thus aspiring to connect with the users the dangers of coercive situations.

The combination of both parts of the game, incorporate the learning objectives and the measures that were identified to deliver them.

1.7 Arrangement of Thesis

This thesis will provide a documentation of the research, design and development processes undertaken throughout the project PR:EPARe (Positive Relationships: Eliminating Coercion and Pressure in Adolescent Relationships), from the lead designers perspective. A comparative analysis into the literature surrounding serious games development strategies and an examination of the fundamental concepts of games design and health interventions is undertaken in order to determine key methodologies adapted from the methods/frameworks; the 4 Dimensional Framework (4DF) [3], the Mechanics, Dynamics and Aesthetics (MDA) model [2] and the Intervention Mapping approach [1]. The analysed methods/frameworks in this thesis have directly informed the design and development decisions taken by the designer and project team throughout the process of PR:EPARe.

Developing on from the development methods applied from the methods/frameworks, a reflective analysis of the evaluative data, both quantitative and qualitative is carried out by the researcher and mapped against the decisions taken in the research and development phase of the project. From the findings in the data analysis, correlative themes and positive data shall be taken forward to produce a final development methodology. This methodology shall pull together the methods that were found to be productive throughout this research project and will provide guidance in future work for developing serious games especially in the area of game-based intervention approaches.

With these objectives in mind, chapters 2 to 3 of this thesis explore the surrounding literature and previous research taken that informs the pedagogic and design considerations used in the pre-production and planning stages of the PR:EPARe project. These considerations are mapped against the learning outcomes delivered by SASH from the IM approach. These chapters fully explore the key considerations that were influenced from an consultation of the frameworks carried out by the research and development team whilst developing PR:EPARe.

Chapter 4 will examine the development strategies and the process taken throughout the production phase including the design sessions and the methodologies adopted by SASH. This chapter will also highlight the development methods chosen by the lead designer that were influenced from the 4DF and MDA models and how these were used

to compliment the methods that SASH were adopting from their use of the Intervention Mapping approach.

Chapter 5 will address the researchers methodology and explores how the PR:EPARe data was captured and how it was analysed.

Chapter 6 will look at the evaluation of the quantitative and qualitative data gathered by SASH in their final report of the PR:EPARe game [7]. A reflective analysis is drawn against the design and development methods that were implemented from the guidance of the IM, MDA and 4DF frameworks and their perceived results mapped against the evaluative data. This chapter provides the evidence to support the methods taken forward to create the overall aim of this research, a preliminary methodology for consideration to aid future game-based intervention developments.

In chapter 7, the DeLHTA methodology is introduced and the themes chosen within DeLHTA are discussed as to their relevance in creating an effective aid to serious games development. Considerations to the design choices taken are reflectively discussed and the methods taken forward are identified from the evaluative data for facilitating further development in this area.

Finally, chapter 8 outlines the researchers conclusions as to the overall effect of the PR:EPARe project and its data is explored to provide a look at the impact that the game could have if introduced into mainstream education. The overall objective of the research, the DeLHTA methodology, which was produced from the data analysis, is summarised and future works are discussed and put forward in the hope to provide further evidence to support the DeLHTA's efficiency.

2 Research Background

2.1 Sex Education

In order to assess the context and needs of a game based approach to relationship and sex education, a look into current literature and research was conducted by the SASH group in order to determine gaps, concerns and problematic areas. Presented in this section is the researchers own sample of research conducted from a systematic literature review of current issues in delivering RSE within a classroom setting, this helped orientate and inform the researcher in the development process of PR:EPARe.

Delivering health and sex education within a classroom context has inspired many philosophical debates into the moral and ethical responsibility of the educational system. Concerns cover a spectrum of potential issues such as, but not limited to, culture, gender, sexual orientation, religion and appropriate age versus content. Controversial as it stands; sex education is wildly disputed, with concerns as to the impact on student's behaviours through RSE content learning, and whether this ultimately contributes to negative behavioural outcomes as a result [8]. However, regardless of the diverse perspectives as to the context, aims and methodologies of RSE, subject matter development and synthesis is identified as a high priority issue within the general consensus [9]. The government's recognition of this and in order to promote healthy sex education and provide adolescents with adequate knowledge to make informed choices was realised within the Education Act of 1996 [10] with additional content updates following in the Learning and Skills Act of 2000 [11].`

Whilst these legislations provide a suitable framework for educational establishments, enquiries as to the methodology of best practise in delivering RSE within a classroom context are often left undecided and subsequently inadequately taught. In the 1990's, little evidence could be attained to support any of the various emerging theories that were for or against behavioural intervention methods. The absence of dedicated research into the progressive role of sex education and its impact on student's sexual behaviour identified a necessity to evaluate sexual health intervention techniques and prevention methods.

In the early 1990's, concerns surrounding four key areas of young people's attitudes to sexual health, HIV, abortion, STI's and coercion developed from an analysis of rising statistical information [12]. In an attempt to gain understanding as to a principle approach to combat this, a trial, developed and piloted by the Health Education Board for Scotland (HEBS), proposed a new programme that was theoretically-informed and led by educationalists. The programme entitled *SHARE* (Sexual Health and Relationships - Safe, Happy and Responsible) [13] was piloted using a balanced randomised control trial across twenty five schools in Scotland. Each school was assigned to either the SHARE programme or instructed to continue with their existing sex education lessons. Based on Ajzen's theories of planned behaviour [14], the SHARE framework adopted a social-psychological and sociological approach previously explored by Wight et al. [15] in an attempt to assess cognitive approaches to behaviour control against those traditional methods laid out by the NHS. It emphasises that failure to address psychosocial elements and individual cognitive development through traditional means of RSE, promotes a shortfall in the management of personal and situation based awareness.

Currently, effective relationship and sex education (RSE) as outlined in the Department for Education and Employment [16] guidance report, emphasises the requirement to establish and support young people through their exploration of sexual development. Referring to the National Healthy School Standard framework [17], the report concludes that schools developing best practise in their curriculum, should look to include content that covers the physical, emotional and moral aspects of RSE in order to provide a comprehensive syllabus. In short, a balanced syllabus that is inclusive and explores the theory and practical subject matter that promotes critical thinking and encourages students to engage in informed choices when presented with personal or social situations.

Although educational institutions are offered guidance as to the content that should be offered, the design structure and delivery remains at the discretion of the individual school. The Department of Education website provides the information that generally, academies and Free Schools are required to provide a broad and balanced curriculum to include English, maths and science and to make provision for the teaching of religious

education. Beyond this they have the freedom to design a curriculum which meets their pupils' needs, aspirations and interests. [16] Whilst this provides a flexibility to design a relevant curriculum to support specific needs relevant to the institution, for example, religious or cultural establishments, inevitable deficiencies in certain subject matters are likely to be apparent.

A 2009 study by the Dáil na nÓg council [18] found that across thirteen counties in Ireland, 88% of students received SPHE (Social, Personal and Health Education) with the most emphasized theme being centred on drug, alcohol and solvent use. However, the same study identified that 74% of students received no RSE (relationship and sexuality) classes throughout that year. Those that did receive RSE identified the most emphasized theme as being healthy relationships. The below tables outline the frequency of RSE delivered and the subject areas that were covered alongside percentages of time allocated to each theme.

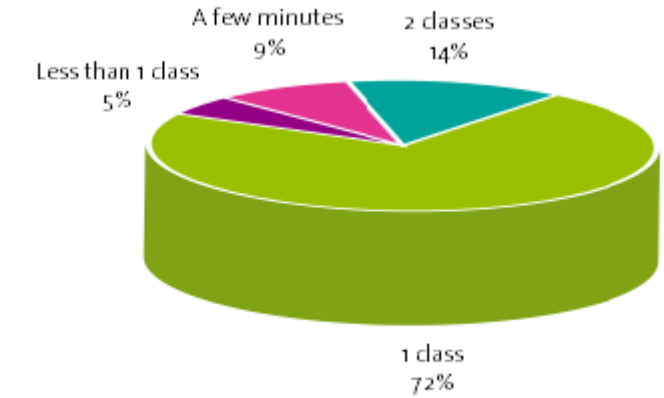

Figure 1 Average Length of RSE Lessons [18]

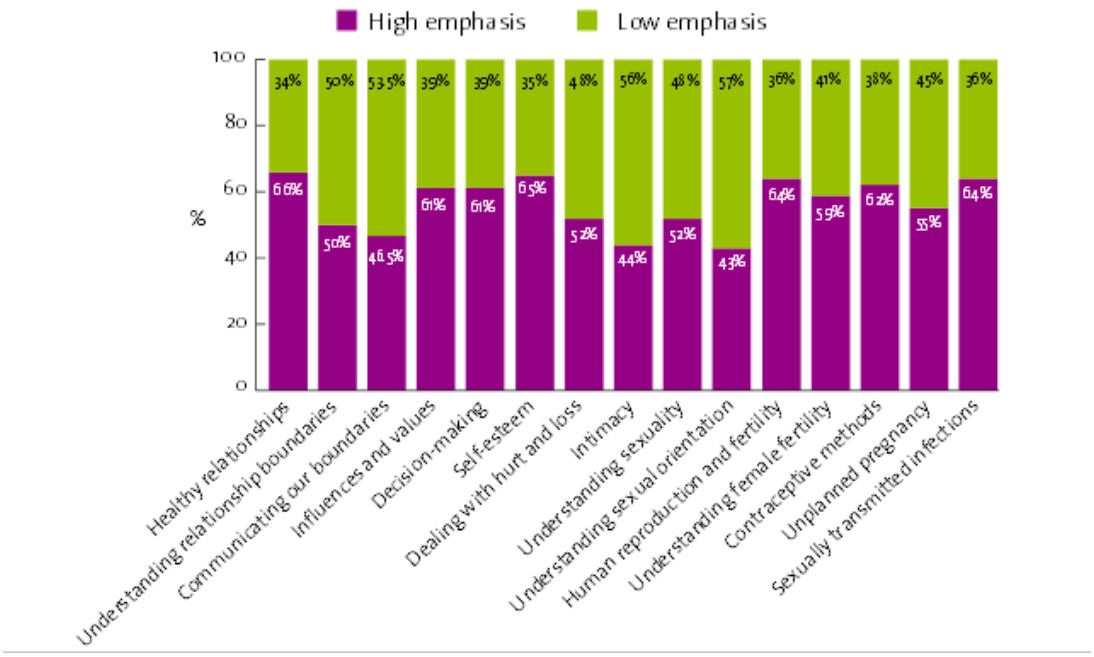

Figure 2 Emphasis Placed on RSE Syllabus Themes [18]

Indications of reluctance to certain themes, particularly sexual orientation from these figures, suggest possible biases towards what is deemed as acceptable content. Despite this, the predominant issue of the study shows a preference to adopting a curriculum based on the PSHE lesson structure, omitting RSE lessons altogether. Rather than acknowledge necessity and desire from the students to receive a comprehensive and balanced education, content as shown in this case, leans towards other health related issues whilst offering very little on relationship and sexuality guidance. Sexuality as described by Epstein et al. [19] refers to a wholly heterogeneous practise that examines not only sex and gender, but delves much deeper to understand dispositions, habits and identity.

Focus of the educational syllabus has often drawn away from the emotional context of relationships within sex education, with young people commenting on the absence of any meaningful and practical relationship advice [10]. A more recent survey conducted by CHSS [20] on the current state of sexual health education and services in Kent, reported that respondents perceived obtaining a greater level of instruction in physiological aspects of RSE in favour of psychological and emotional guidance. Although several years after the DfEE report [16], attitudes to discourse of emotions

and relationship guidance seem to have remained comparable with a strong emphasis on the physical implications of un-safe sex. These findings highlight a need for schools to re-assess their commitment to the RSE curriculum content, in order to include a broader range of emotional contexts that young people and adolescents can engage with. A re-assessment of the curriculum as out lined on the Department of Education's website [16] now demonstrates that health and sex education is to fall under the title of Personal, social, health and economic education (PSHEE). Whilst this allows coverage of several areas previously considered low priority or un-suitable topics, training in the subject material and delivery methods are required in order to create PSHEE lessons that present high impact guidance for young people.

In light of the various resistances and challenges to didactic approaches of RSE faced from both student and educationalist perspectives, game based learning (GBL) incentives have been adopted in an attempt to undertake some of the challenges faced. Currently there are several GBL projects available to purchase, download or free play on the internet, which incorporate various topics in the field of RSE and guidance. Presented next are three different GBL incentives that are currently in circulation in schools and available for use. These examples show the different approaches that have been taken in the design process, to create focused solutions for their target demographic users.

2.1.1 Privates

'Privates' is a sex education game commissioned by Channel 4's educational programme and developed by the games company; Size Five Games (formally known as Zombie Cow Studios). Aimed primarily at the male, 14-19 year old demographic it is intended to function as part of the Key Stage 4 (Ks4) curriculum, it takes an innovative approach to informing young people as to the dangers of un-protected sex, STD's and the morning after pill.

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Figure 3 Screenshot from "Privates" game [21]

‘Privates’ is intended to provide accessible RSE to a wide ranging audience and as such is a free to download, PC platform game. Developed as a 3D gaming experience, environment and character art takes its thematic influence from the human form with particular emphasis placed on the reproductive system and the genitalia, both male and female. The design of the overall game has been in an effort to provide an entertaining, comical and more importantly educational exploration into sexual health. This approach has combined highly stylised art and gaming mechanics that target young male players in an effort to maintain interest and motivation. Studies into age and gender in gaming genres have found that a higher percentage of males prefer to engage with ‘shooter’ and ‘action’ based games.

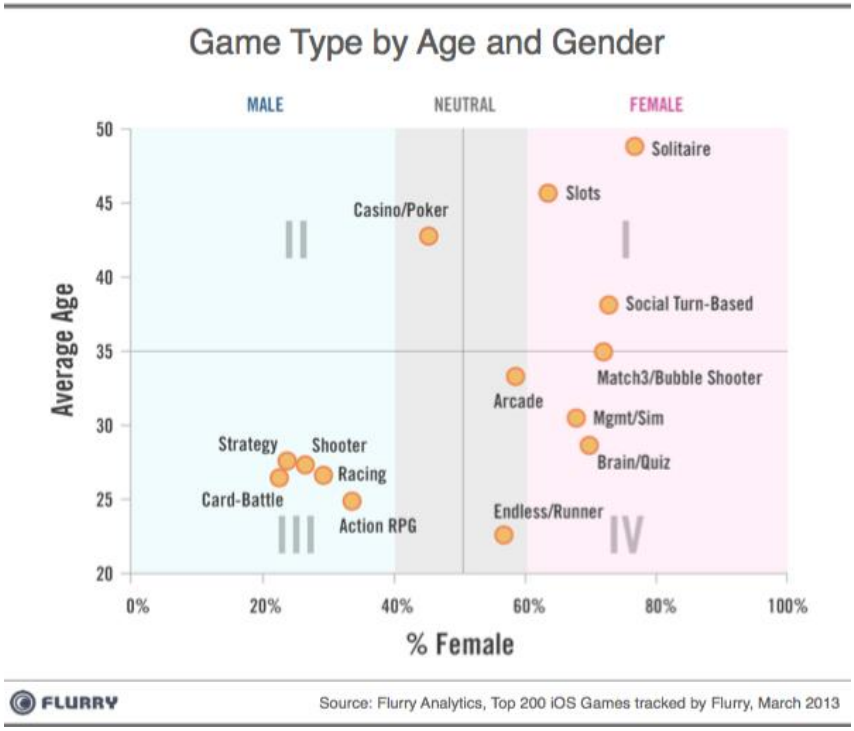

Figure 4 Survey of game type by age and gender [4]

The development of Privates reflects the research led choices in genre and mechanics design, in an effort to motivate its target demographic, leading to the game being developed as a 'platform twin stick shooter' according to the developers [21]. By relying on humour as a central element in generating interest in the hard to reach target group, more emphasis is placed on the game play rather than that of the educational value. Although this is provided in the game, it is there rather to deliver information and promote consideration into the dangers of un-protected sex. This approach is novel in the application of GBL interventions as many developers try to instil learning and feedback mechanisms within the game to enforce and ensure that learning is taking place rather than rely on game play to implement understanding of the subject area.

Whilst Privates provides a humorous and outright bold interpretation of RSE concerning STD's and sex, there have been several concerns raised over the execution and suitability of the game. Several complaints have been made against the design of the game for being too male centric, leaving female learners with a sense of detachment from the experience. Following on from this, concerns have been raised about the

language used in the script, audio and marketing design. Again this has been led to have a wholly male perspective, with some uses deemed as derogatory towards women. Whilst the commissioners and designers have insisted that this was not intended to offend anyone it is an important point to note the potential risks associated with language in the development of any game which features sensitive material, particularly when using humour. 'Privates' has also been under scrutiny to assess if the approach of using game-play as a central component to GBL rather than learning and evaluation yields greater results. Research is currently still on-going, however results as to the overall player time spent suggests an increasing argument for using game-play as a motivational tool for learning.

2.1.2 What should we tell the children?

Research has shown that the UK has the highest teenage pregnancy rate in Western Europe, with Coventry city rating at 35% higher than the national average. As a response to the worrying statistics 'What should we tell the children' (WDWTTC), was commissioned and developed by NHS Coventry, Coventry County Council, NHS Warwickshire, Warwickshire County Council, games developers Playgen and the Serious Games Institute (SGI). The game was funded by NHS Warwickshire and the evaluation phase carried out by West Midlands (South) Health Innovation and Education Cluster. The game 'WDWTTC' targets an altogether different end user to traditional GBL incentives previously developed for RSE, the parents and guardians of primary and secondary school children. Aimed at parents with children exploring sex and relationships, the game emphasises healthy discussion and helps parents/guardians to practise and develop skills in communicating difficult subject matter relating to sex, in a safe virtual environment.

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Figure 5 Screenshot from "What should we tell the children" game

Developed as an interactive 3D simulation, the game is divided into two sections, one for parents with younger children, age range of five to nine, and the second for parents with older children, aged ten to fourteen, allowing for a wider reach within the target demographic. In an endeavour to increase positive attitudes and enable practise of developing skills in communication, the developers created a simulated experience in which role-play is a central dynamic that the games design is based on. Combining a series of private and public scenarios, the player is asked to respond to a set of questions asked by the 3D avatar, resulting in either positive, negative or neutral responses. The game provides a delivery method that can be accessed at the individual's own time and pace, and gives tailored feedback in an environment whose users can relax without pressure or embarrassment. The design of the game incorporates positive reward and feedback mechanics in order to maintain engagement and promote sophisticated thought from its players. By using a simulated experience, players can relate to and replicate events experienced in 'WDWTTC' to real world situations. By encouraging growth and development away from relating topical conversations of sex and relationships to uncomfortable situations, the game looks to promote confidence in its users to apply their skills away from the virtual world.

2.1.3 Adventures in Sex City

'Adventures in Sex City' (AISC) is a game that targets the topic of un-safe sex and the physical implications of STD's by using a similar approach to 'Privates' in its use of comedy and shock value to engage users. 'Adventures in Sex City' was developed in collaboration with Mind Your Mind, Ontario, London-Middlesex based youth mental health website and support program. Using a participatory design approach, a group of youth advisors aged 16 – 20 were engaged to create several concepts that could be used in an effort to make sex education more interesting for young people. Incorporating creative ideas of the youth advisors, the game is a product of a direct influence from their participation. AISC is made up of two sections, the first concentrates on STD's and allows the player to test their knowledge of safe sex, and the second section looks into substance abuse with a similar emphasis on testing knowledge.

Figure 6 Screenshot from "Adventures in Sex City" game

By dividing the game into two sections the developers can cover several topics in one game. This seems to be a popular choice when developing serious games in this area and a beneficial one as the game reaches across to other target groups. The overall design of the game takes a very different stance aesthetically to the previous games that we have viewed, opting for 2D graphics, in a comic style approach. Whilst the visual style reflects current trends in popular youth culture, some could view it as gender biased towards a more male demographic. The visual style should remain gender neutral

in an effort to appeal across the board. The game delivers feedback through a score system, allowing the player to fight of enemies with every correct answer given. Using this method of delivery, ‘AISC’ aspires to deliver quality information to the player using question and answer level mechanics.

2.2 Serious Games

Traditional social understanding of video games have previously held no society based value other than that of pure entertainment and have thus been thought of by many, to provide a detrimental impact on our youth culture. Games are often perceived to hold more negative consequences from use, often cited as cause for violence or disinterested behaviour within the younger generation of gamers. Increasing efforts to develop digital games that benefit society are however challenging these existing conceptions of use and are expanding into various social circles as issues, such as education; health and business are examined through the use of digital media. Largely referred to as Serious Games, many definitions have come forward to try and illuminate what a serious game constitutes, however Zyda [22] who recognises the educational opportunities and benefits to be gained with research into games, offers his own description as being;

> *"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."*

This definition provides a fundamental reference point for the use in the development and application of digital games that fall within a wider context than those digital games that provide worth inside the context of pure entertainment. The serious games movement provides proof according to Jenkins [23] that the gaming medium is falling significantly short of its potential. Furthering on from this definition, Zyda outlines that the key aspects from entertainment games such as story, art and software have to be combined alongside that of pedagogic theories whilst developing serious games. In essence Zyda believes that an instructional or learning value must be present within the gameplay in order to be considered as a serious game. In the below figure, Zyda outlines the inclusion of the pedagogic component whilst in the development phase of a serious game.

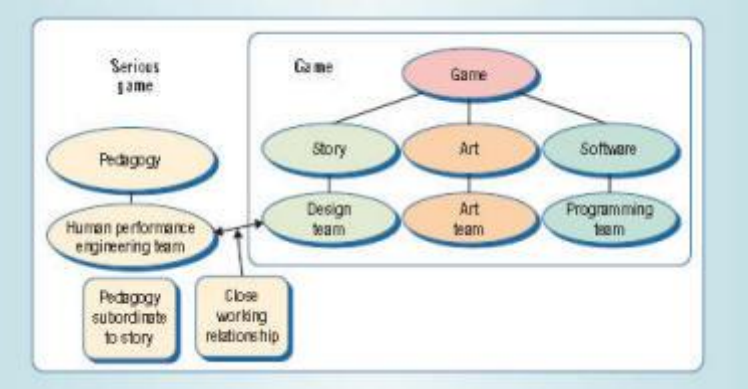


Figure 7 Zyda's analysis of the pedagogic relationship in serious games [22]

Whilst Zyda recognises the potential success that can be obtained for educational and learning content to be imbedded within a gaming environment, he insists that the pedagogic delivery should remain a subordinate element to the main narrative context of the game. Once these main elements are addressed, the educational content should only then be integrated in order to complement and enhance the overall gameplay experience. Whilst Zyda presents an interesting theory as to the design principles of a serious game, his theory of learning within a games environment is one shared and recognised throughout the games industry and the academic world, in that games have the ability to provide a rich learning context for players [24].

Digital games often present the player with a set of challenges or a series of tasks through various objectives set throughout the game. Players are expected to follow a series of learning outcomes in order to succeed; these are standard procedures within a gaming environment that a player will happily accept in pursuit of progress. Academics have since recognised that research into player acceptance through game based learning could lead to an increase in the use and deployment of educational technologies within mainstream society based settings, such as schools and healthcare institutions. Furthermore, academics such as Norman [25] have theorised that the informal learning experience that players achieve via game play has been likened to the progress that can be achieved similarly through a more traditional learning methodology approach found in educational institutions. Consequently, many serious games attempt to harness a player's capability for collateral learning by providing an immersive environment in

which educational content can be explored through alternative approaches. These digital environments that can be developed to contain multiple methods of learning theories, can reach heterogeneous students that respond to different teaching methods. If this is realised then instructional technologies within an educational context could provide the answer to revolutionise text book learning and increase student's intrinsic motivation to learn.

Whilst serious games have shown their capability to be affective as educational tools, many queries as to why have been raised by academics that seek to harness the power of game based learning. Prensky [26] puts forth two key premises for game based learning that he believes are not accepted within the training community. The first being fundamentally that learners have changed and that our preconceptions of best practise in traditional learning and delivery are outdated. Prensky recognises that intellectually, the trainees of today are completely different to those of a past generation, with different expectations and attitudes to educationalists and training programmes. As a result the needs to address these changes are a priority to understanding the success of game based learning. Prensky's second theory is that the new generation of learners have grown accustomed through video games and digital media to new experiences of learning through play. This theory suggests that learners have developed through the continued use of advancing technologies, additional preferences outside that of the traditional learning theories, and have subsequently changed the way in which information is processed. This new generation referred to by Tapscott as the Net generation or N-generation, [27] are the first to grow up surrounded by digital media and the internet. With such immersive technology as a commonplace requirement of everyday life, the n-generation is now challenging the way in which learning and communicating are perceived. Furthermore, studies into the efficacy of text book learning have shown that students entering college now lack the required skills in literacy to benefit from an education through text book delivery [28]. With the decline in reading and the increase in technological proficiency developing amid today's society, the development of digital teaching tools present an experimental method in combating this problem. Following these thoughts, research into digital games and virtual worlds for non-entertainment purposes, has since attracted practitioners and theorists across multi-

disciplinary backgrounds with the collective intent to advance the field of interactive technology with that of pedagogic and behavioural theories.

2.3 Attitudes to Serious Games Development

Within the digital sociocultural evolution, innovative research has emerged to consider the practicalities of assessing the fundamental aspects to designing and implementing games for learning [29]. Whilst this holds true in the academic sense, the general impression and effect that digital games have played within our society, has led to many a discourse surrounding the potential benefits and consequences of developing games for non-entertainment purposes. Contrasting opinions generally place people at opposite ends of the spectrum, conveying either an enthusiastic or critical approach to these theories. De Aguilera [29] refers to these view points as the *apocalyptic* (outright rejection) and the *integrated* (acceptance of electronic communication). The *integrated* view of acceptance stipulates that games and technology form a vital part in our contemporary culture, and further outlines the importance of combining pedagogic theory with emerging technologies in an effort to revolutionise the learning experience.

Another long standing debate in the development of serious games, that is particularly relevant to this study, is that of the value assigned to the different factors of serious games when embarking on a development project. Researchers and designers views on this topic often range, with emphasis being weighted towards one aspect of serious games such as learning content, game design or assessment, rather than balancing each feature on an individual basis. Certainly some examples of this can be found in the definitions that are given to serious games on the whole. Game designers Michael and Chen seem to suggest that a serious game should be wholly concerned with the educational element and define serious games as follows:

> *"A serious game is a game in which education (in its various forms) is the primary goal, rather than entertainment".* [30]

Whereas Zyda offers a more open definition on the matter stating:

> *"Serious games have more than just story, art, and software, however. (…) They involve pedagogy: activities that educate or instruct, thereby imparting knowledge or skill. This addition makes games serious".* [22]

It is from these definitions that serious games are thought of in one way or another as a digital experience that contains a greater pedagogical content within their formal structure as to those games of an entertainment nature. However, it is important to address a common understanding in current games research and culture, that all games, entertainment or serious, board or digital, provide a learning experience, even if it is as straightforward as mastering the game.

A proponent of this view, Ralph Koster, explains his belief that all games, train us to see underlying mathematical patterns and that games tend to focus on experiential teaching [31]. Following on from this, he observes that games train their players to ignore the fiction that wraps the patterns [31]. His view is that the visual metaphors and their traditional meaning such as violence, blood and sex, are often lost on the player who is more interested in completing the pattern. This observation serves as a question of the overall significance to the aesthetic tendencies of games, both serious and entertainment, and whether aspects such as story, visual art and sound, or "dressing" is largely irrelevant as Koster believes [31].

Another view, is that it is the player's ability to control the game, is behind what keeps players motivated and is one that is shared with several theorists including Prensky [26] and Rieber [32]. According to Rieber, the criteria for an intrinsically motivating game, is largely similar to those for an intrinsically motivating learning environment [32]. He lists these elements as challenge, fantasy, curiosity and control [32]. These same elements are found in the MDA method later discussed in Chapter 3. In short, Rieber adopts the position that in order to positively influence a learner's intrinsic motivation, engagement in learning and learning performance, then these mechanical elements need to be addressed at a games core.

If it is a generally accepted view that all games provide a learning experience, then it is important to address what makes serious games stand apart from the rest and what is needed for the player to achieve a higher learning state. Game researchers Breuer and Bente [33] voice the opinion that it is not a sufficient solution to assume all games can be considered as learning material, and In particular it is not as simple as attaching learning material into a game setting for achieving positive results with a learner [33]. As a result it is often commented that a balance between learning scenarios and game

play, otherwise known as ‘the sweet spot’ by Squire and Jenkins, [34] is achieved in order to create a successful serious game.

In order to address the integration of games and learning, Ritterfeld and Weber, [35] propose three approaches to tackle the problem, titled:

- Reinforcement paradigm: The entertaining parts of the game are offered as rewards for successful learning
- Motivation paradigm: Entertaining game elements are used to evoke the learner’s interest, focus her/his attention and make her/him ready for the learning procedure
- Blending paradigm: The learning procedure itself is designed to be entertaining, i.e. the enjoyment of mastery in the game is equivalent to the enjoyment of the acquisition and use of knowledge and skills

These examples attempt to foster both intrinsic and extrinsic motivation for the player, by using game elements as a way to capture attention and reward the player for showing mastery of the learning content offered. Additionally, Ritterfeld and Weber [35] propose that there are three relationships between entertainment and learning:

- Linear positive (facilitator hypothesis): More entertainment means more effective learning
- Linear negative (distraction hypothesis): Entertainment distracts from learning, i.e. more entertainment leads to a decrease in the learning performance
- Inverse U-shaped (moderate entertainment hypotheses): Entertainment is beneficial for learning, but only until a certain point. If this amount is exceeded, the added entertainment value is detrimental for the learning outcome

Breuer and Bente [33] adopt the view that the third relationship is likely to be true as the effectiveness of games for learning does depend on the enjoyment the players experience as discussed previously by Prensky [26]. They expand that the obvious differences between commercial entertainment games and specially designed learning games show that, indeed, there seems to be a trade-off between entertainment and learning [33].

One aspect that these relationships highlight is the possibility of a blended strategy for serious games. Rodriguez [36] continues this school of thought by stating that in order to question how to use games as ideal learning tools, the initial step should be to identify the playful elements of learning and to design games for educational purposes accordingly. In essence, learning and play become one and the same in this approach in which the ideal game combines learning and entertainment so that the player does not encounter the learning as an external part to the game.

Prensky was a keen adopter of this vision of serious games and expressed the term for this approach to integrating learning with entertainment as 'stealth learning.'[26] The ideal of 'stealth learning' was that the game would not out rightly state the learning objectives and so had no learning stigma attached to it. As a result the player would not realise they were learning and would continue to play the game enjoying the entertainment and benefiting from the hidden learning content.'

Whilst this opinion, that entertainment should play a larger part in serious games is a popular belief, there are others that disagree and insist that 'stealth learning' doesn't achieve significant outcomes in serious games. Whitton and Moseley [37] believe that 'stealth learning' undermines the role of the learner and does not get to the heart of the learning process. Furthermore, they voice that reflection and self-evaluation is an important process of learning and that it is essential for the learner to recognise when learning is taking place so that they can utilise these techniques. Adams [38] also speaks out against the idea of 'stealth learning' by highlighting commercial games that are often offered up as educational games. He lists 'SimCity' and 'Civilization' as examples of off the shelf (CTSO) games that impart some factual knowledge and certain principles to their players by using a technique of 'stealth learning.' His opinion however, states that players only learn to beat computer games by trial-and-error which is a pedagogically inefficient process. He concludes that whilst games developed in this style may provide an enjoyable experience for the player, the time the player spends learning to recognise and learn underlying principles is inefficient compared to other methods of learning [38].

These views offered here, provide a look at the current debates on the role that learning content should take in serious games. Whilst there are obvious proponents and critics

for learning content and entertainment rankings in serious games design, there appears to be growing support for a blended approach to development. There is a general agreement in the field of educational games that games and learning share similar elements such as goals, challenge, fantasy and curiosity as described by Malone and Lepper [39]. These similarities should therefore be utilised to complement both learning and entertainment aspects in the development process of serious games.

By creating similar paradigms as that to Ritterfeld and Weber, [35] serious game development can move forward by emphasising the necessity for a blended learning experience which seamlessly integrates enjoyment and learning. By doing so, developers in this field seek to ensure that future serious games will present the learning content as something which is neither external to the game nor a juxtaposition of entertaining sequences and educational material, and thus achieving the proverbial 'sweet spot' of serious game design.

2.4 Motivation through Flow

Following the current debates into what areas of serious games effect efficiency, a look at user motivation is needed to draw conclusions.

If motivation provides the core understanding of reason behind a person's ability to take action, then learning and motivation are but two parts of the same objective [40]. Action fuelled by motivation demands a level of personal commitment, be it physical or emotional. Furthermore, similarities of the experience of motivated action are found during play. Play provides opportunity to commit to a series of determined actions and through personal choice; a player can devote themselves wholeheartedly into a given task, whether it provides extrinsic or intrinsic motivation.

The design of a serious game fundamentally requires multiple methods of integrating motivation mechanics and techniques in order to engage a player and increase their incentive to continue interacting with the gaming environment. Motivation has been considered to be one of the key strategies in learning theory [41], which has led academics to consider the value of integrating learning content with the motivational techniques that are found within digital games. This theory suggests that fun acquired through digital gaming will increase player motivation which will in turn aide learning.

Research into this area has suggested that Csikszentmihalyi's Flow Theory provides an insight into why player motivation is achieved through gaming, and how it can be harnessed. Csikszentmihalyi's theory is based on the idea of intrinsic motivation where the reinforcement gained was that of conducting a task in itself [42]. Csikszentmihalyi saw that intrinsic motivation fell outside the realms of the traditional view of reinforcement as it shied away from conventional rewards to be gained such as money, recognition or achievement. Instead he referred to Maslow's [43] original observations of intrinsic behaviour as the desire for "self-actualization", where the need to discover the potential or limitations of the self were greater than any extrinsic reward [42].

The need to achieve through any challenge presented, serves as sufficient motivation in the case of many activities. The mental state in which players exert immense efforts of concentration on a particular task, has been documented by many as a pleasurable experience often resulting in long-term efficacy in the area [26]. This psychological experience is referred to as the 'flow' state. This is shown below in a figure of Csikszentmihalyi's flow theory.

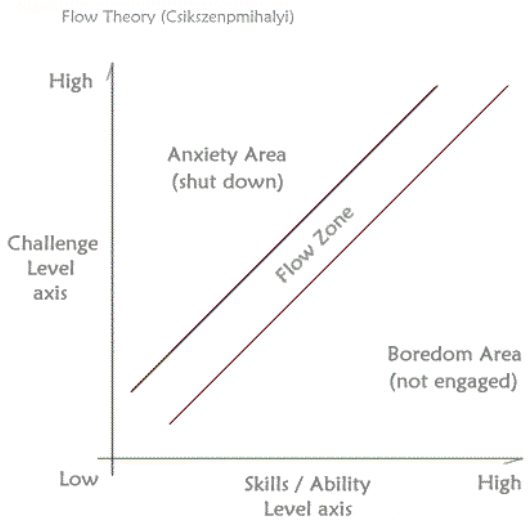


Figure 8 Csikszentmihalyi's flow theory [42]

The ideology of 'flow' is to keep the person actively in the state by balancing the challenge level against the skill that they are applying. Increasing the challenge level to the point that the game becomes too hard will set to increase the amount of anxiety that the player feels and force them to shut down. Conversely, lowering the challenge level

can create the feeling that the game is too easy in which the player will become bored and unengaged. The ideal state is to create a balance between the two to prevent either option occurring.

Whilst effective game design in entertainment games can control the 'flow' state of the player, serious games prove more challenging. This is due to maintaining player 'flow' not just within the game state but also within the tasks set out for learning. Flow can be said to occur when people are able to meet the challenges of their environment with appropriate skills, and accordingly feel a sense of well-being, a sense of mastery, and a heightened sense of self-esteem. This is the challenge put forward by Csikszentmihalyi, that in order to further understand the area of game-based learning, the developers of such programmes need to ensure that the player feels motivated and maintains a sense of the 'flow' state.

The power of game-based learning in educational environments is slowly being recognised with the help of research into the effective affect it has on the user. One such a report from the 2006 Summit on Educational Games by the Federation of American Scientists titled "Harnessing the Power of Videogames for Learning" [44] states that:

> *"Students remember only 10 per cent of what they read; 20 per cent of what they hear; 30 per cent if they see visuals related to what they hear; 50 per cent if they watch someone do something while explaining it; but almost 90 per cent if they do the job themselves, even if only as a simulation.*

With this is mind, the potential impact that digital games could have in an educational context could provide educationalists with the much needed tools to address engagement and motivation in learning for today's students. Only with further research that seeks to combine digital games design methodology alongside pedagogic theory, will development in this field begin to excel.

From this initial research into motivation techniques, it is clear that a balance should be maintained between the learning challenges and the game play in order to keep the player motivated. This will require the researcher to develop a balance between entertainment mechanics and pedagogy to ensure that the game PR:EPARe has a chance at being well received and that any learning objectives are met.

3 Framework & Methods Research

This chapter presents the research conducted on the selected health intervention and game design frameworks to assist in the development of the PR:EPARe project. Whilst conducting a quick scope review of available frameworks and methods that tackle serious and entertainment games design, many surfaced that were considered for the purpose of developing a new method.

Researching serious games development methodologies, examples such as the Triadic Game Design framework, [5] the Emergo method and toolkit, [45] and the Four Dimensional Framework [3] predominantly emerged from the review amongst other methods. Each of these examples initially showed a greater balance between the development techniques of serious games including entertainment, learning content and assessment. Whilst each of these examples displayed the balance that was required for the development of a new method, the Four Dimensional Framework showed a greater interest in focusing on different user perspectives not just the learner. This was an area that I was keen to explore further and address within this projects scope.

In terms of methods and techniques research in the field of entertainment digital games, there were little examples of fully developed methodologies available for aiding the design and development of entertainment games. The most prominent example of an entertainment games framework that emerged from the quick scope review was the Mechanics, Dynamics and Aesthetics method by Hunicke et al. [46].

Whilst the MDA, was the forerunner in terms of an entertainment games framework/methodology, other cases such as Jesse Schell's, The Art of Game Design [47] and PopCap Games open source framework [48] for developing casual games, highlighted some noteworthy principles of games design. These examples emphasised the need to think strongly about the effect that the developer's design of mechanics, story, and aesthetics alongside the use of technology will have on the player. Schell [47] states that each of these areas can be united to create different game values and inspirations that done well, can create player experiences that are powerful and unique.

The examples presented in the quick scope review for entertainment games design showed a number of relevant methods that could have been used in the development of PR:EPARe, however the MDA provided a fuller methodology with specific procedures to consider in terms of entertainment games considerations. In light of this, the MDA was chosen to represent entertainment games design and development for the purposes of the research.

In terms of health intervention design approaches, it was important that this research adopted a similar stance to the research that was being conducted by SASH. For this purpose, the IM approach was adopted in this research to synchronise with the methods that were being already adopted in the research stages of the PR:EPARe project.

The frameworks that were chosen in light of the evidence were the Four Dimensional Framework by De Freitas and Oliver, [3] the Mechanics, Dynamics and Aesthetics Method By Hunicke et al. [2] and Bartholomew's Intervention Mapping approach [1]. This chapter presents an overview of the three methods/frameworks that were adopted and contains the core concepts that were relevant to the methods used in the development process of PR:EPARe.

3.1 The Intervention Mapping Approach

This section of research was undertaken by Coventry University's SASH group and outlines the preparation and research of developing a serious game targeting relationships and sex education using an Intervention Mapping Approach (IM) [1].

Using the process of Intervention Mapping, a needs assessment identified coercion as an area in relationship and sexual health that was not often addressed in schools and educational settings. As a result, coercion would be the topic covered in the serious game based approach, PR:EPARe. Using IM, SASH was able to define programme goals, change objectives and evaluation strategies that were included and translated into a serious game concept.

An Intervention mapping approach is a logical planning framework in which the needs and requirements of the patient and stakeholder are considered against clinical evidence, to provide an application that is both evidence and theory based. Bartholomew et al. sum up their intentions of the Intervention Mapping Approach by stating;

> *'One difficulty that planners may encounter is that of delineating tasks for the development of health promotion or education programs that are based on theory, empirical findings from literature, and data collected from a population. Existing literature, appropriate theories, and additional research data are basic tools for any health educator, but often it is unclear how and where these tools should be used in program planning. In intervention mapping, these tools are systematically applied in the process of program development.'* [1]

An example of how the Intervention Mapping approach is currently being used to aid the health sector can be found in a study by the School of Sport, Exercise & Health Sciences, at Loughborough University, [49] to develop a work-related guidance tool for those affected by cancer. The research indicated that support and assistance were essential for working-aged patients that were diagnosed and treated with cancer in order to make the right decisions regarding work. It was shown that healthcare professionals do not fully consider or understand the work-related needs of patients and employers and the impact this has on the work place and thus a need for a guidance tool emerged. The study used Intervention Mapping to aid the development of a guidance tool to address this area by using the five steps of the IM approach. Gaps of information were identified using the needs assessment which led to programme objectives being identified and set up to guide the tool's development. This was followed by a theory-based method and implementation plan, with a final tool piloted by 38 individuals with varying stages of cancer. Conclusions put forth by the researchers in this study have stated that 'Intervention Mapping is a valuable protocol for designing complex guidance tools.'[49]

The IM framework consists of six planning stages that carry an iterative approach throughout, generating understanding and solutions for various processes across the framework [1]. The intervention mapping steps are briefly lined out below followed by a visual representation of the framework.

Step 1 of the IM approach is a Needs Assessment. This step enforces the assessment of the health related problem. Aided by a planning group and a logic model based on the PRECEDE planning and evaluation framework, [50] the overall aims of the intervention process are identified and defined.

Step 2 of the IM approach is to develop Programme Objectives. This phase of the mapping process sets out to provide the foundation of the intervention by first developing performance objectives for the recipients and then determining changeable determinants of behavioural and environmental outcomes. From these tasks, a matrix of change objectives are created for each level of the planning process and mapped by crossing performance objectives by change objectives [1].

Step 3 of the IM approach is to develop Theory-Based Methods and Practical Strategies. In step 3, theory-based methods are identified and programme ideas should be generated in tandem with the planning group. Strategies and practical applications are developed ensuring that they address change objectives within the intervention.

Step 4 of the IM approach is a Programme Plan. At this stage the participants and implementers are brought together and consultation is sought to determine preferences within the target audience. Design documents and programme content is prepared, translated and piloted with appropriate feedback and review from user testing. Programme materials are appropriately revised ensuring change objectives are met.

Step 5 of the IM approach is the Programme Implementation phase. This step identifies key determinants relating to environmental and behavioural factors which are mapped against performance objectives to ensure successful adoption of the programme. A matrix of change objectives are created for implementation, alongside which the target demographic is selected so that methods and practical strategies are compatible.

Step 6, the final step of the IM approach, is the Evaluation Plan. The final step in the IM sequence focuses on evaluation of the intervention. A review of the logic model is completed and the planners develop a full set of evaluation procedures, including indicators and measures. Refinement of the evaluation process can be re-visited in order to obtain specific feedback.

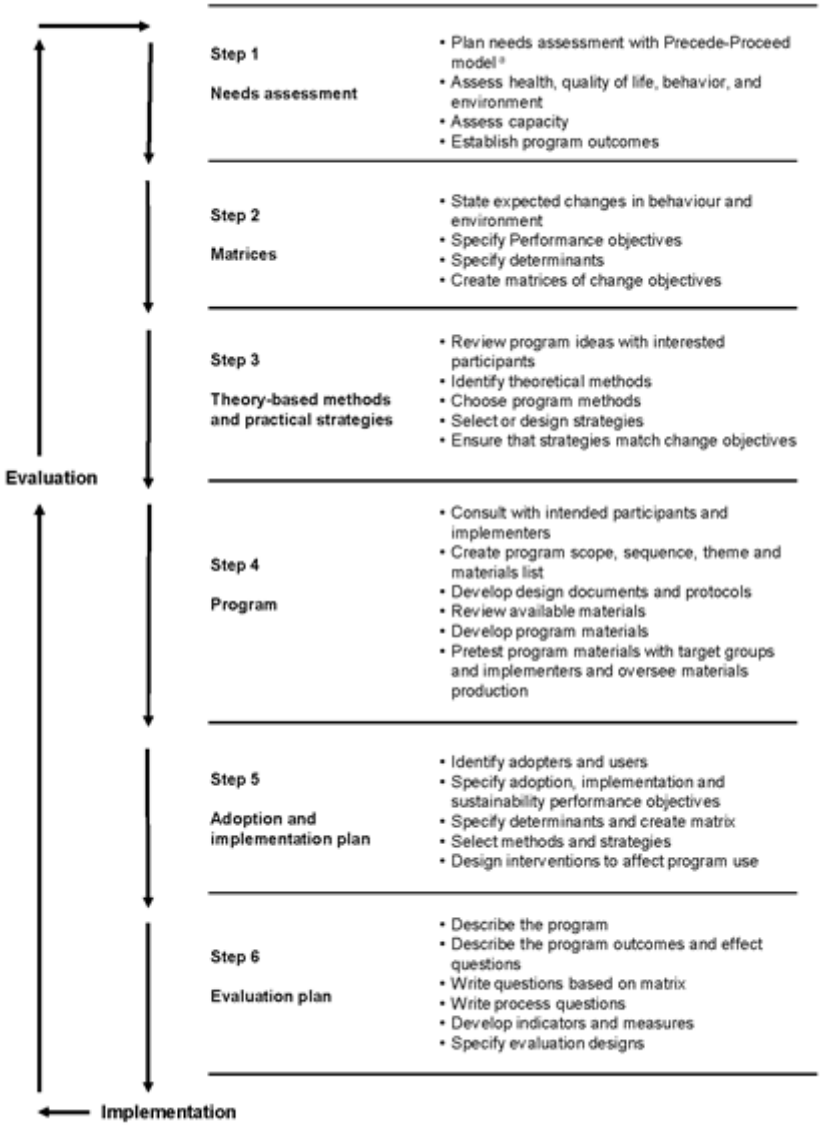


Figure 9 Bartholomew's Intervention Mapping Framework [1]

Adopting the above principles of Bartholomew's [1] IM framework, the SASH group followed a series of work packages set out to facilitate the IM approach in the development of a serious game [51]. Five work packages were chosen to illustrate and inform the design and development processes undertaken in the life-cycle of the project. The write up below follows some of the key elements found in each of the work packages developed by SASH. For a full and detailed account of the project and its development refer to chapter 7 in Arnab et al. [51].

3.1.1 WP1: Initial evidence review and stakeholder groups' engagement

WP1 & WP2 were developed in accordance with Step 1 of the IM approach using stakeholder engagement and a needs assessment to establish the perimeters of the projects research.

The overall proposal of the project was to develop a game-based intervention approach to RSE targeting young people and adolescents. With this in mind, three research questions were proposed in order to address the prerequisites of the intervention including context, content and demographic research [51]. The questions set out below, followed the requirements of the project.

1. What does systematic literature review evidence tell us about the effect of sexual health interventions programmes delivered in educational and school settings?
2. What does recent population-level survey research, tell us about what is needed and wanted as part of RSE in educational and school settings?
3. What on-line/computer-based games already exist that address the topic of RSE and sexual health, and what do they involve?

All in all, seven reviews were identified through a rapid review process that were categorised into three sections detailing positive, inconclusive and negative findings. After conducting a systematic review of the literature, the findings from three reviews suggested that positive effects were found in intervention programmes that engaged young people in a variety of methods or encouraged interaction with technology [52]. Another review that concerned interactive technologies as interventions, also provided positive evidence in relation to safe-sex behaviour [53]. The evidence presented by the review offers up support in favour of a serious game based intervention approach which is rooted in theory and behavioural science [51].

Further to the literature review, a survey report, a review into existing computer-based sexual health games and a stakeholder group meeting were carried out in order to assist developing the evidence base. Focus groups that were previously identified through a stakeholder meeting were carried out, with the participant's needs and wants from a serious game documented. These findings led the way for the needs assessment.

3.1.2 WP2: Needs assessment

A review from the evidence gathered in WP1 commenced following on from three stakeholder meetings, which allowed comparisons to be drawn from the theoretical and group research obtained. The evidence gathered from the first steering group proposed five recommendations to the development of a RSE serious game:

1. The game should be aimed at Y9 (13/14 year olds)
2. The game should complement and fit with existing RSE curriculum
3. Beliefs about peer norms for sexual behaviour are important
4. Improving skills for discussing issues with adults is important
5. Dealing with pressure and coercion in sexual relationships is important

Using this as a basis, the second and third steering group were approached using the same method, with no knowledge of previous group contributions. Developing on from the evidence presented in the table in Appendix C to the researchers, the content of the game was rapidly becoming clear with all three steering groups commenting on developing skills and confidence to help recognise coercion and pressure in relationships. This topic had previously been raised in WP1, and was a logical step to use as a basis for developing on. Further research into the area was conducted to ensure that the topic would complement the existing RSE material taught in Coventry and Warwickshire secondary schools.

SASH created a draft programme goal, taken from the evidence, which was used as a focus point for the intervention planning process. It was important to address the challenges faced with both resisting pressure and exerting it on others [51]. The steering group members were informed of the decision to develop on the topic of coercion with comments from them welcomed, and final validation of the goal led to progressing game based objectives.

3.1.3 WP3: Serious game objectives and concept development

WP3 was developed to coincide with Step 2 & Step 3 of the IM approach, in which performance objectives were identified and change objectives were developed.

Stakeholder involvement was used at this stage to gather feedback on the proposed development on the project.

In this step, a logic model was used to identify the behavioural factors that would contribute to the overall health problem outlined as 'poor sexual health and wellbeing due to experience of sexual coercion' [51], in order to identify its determinants. A list of determinants was drawn up to coincide with existing knowledge gathered from both the literature review and steering group meetings that linked up with behaviour, quality of life and the health problem in question. See Appendix D for the logic model in question.

SASH from this point proceeded to set out a series of performance objectives that behavioural outcomes could be recorded and mapped against to assess whether any change concerning the programme goal had taken place. With the performance objectives represented, change objectives were developed and remodelled in tandem with feedback gathered from the stakeholders. Referring to Bartholomew et al.'s strategies for achieving change in determinate type, SASH listed methods for addressing the change objectives structured by determinant [51]. At that point of the process, amidst feedback transfer, the concept of the games visual style and experience began to take notion and work on developing the content and aesthetic qualities of the game began to flow.

A concept development meeting was set up with The Serious Games Institute (SGI) in order to bring the developers up to speed with the initial findings and evidence gathered from the steering group meetings.

3.1.4 WP4: Game development

WP4 was developed in accordance with Step 4 of the IM approach in which program development commenced.

Through discussion of the evidence presented above, it was decided that one of the proposals set forth, using scenarios to show different outcomes of situations, was a viable option to proceed with and build upon. Although the use of Facebook and social gaming was suggested, both SASH and the lead designer believed this would be difficult to monitor and therefore chose to opt for a controlled environment approach.

The objectives put forward needed the game to introduce and promote recognition of coercion, allowing the player to demonstrate knowledge of the topic itself but to also allow the player to practise responding to coercive scenarios presented. It was discussed that the game should fall into two parts, the first depicting scenarios with wide ranging situations that the player is asked to identify if the state is coercive or not. This is shown in the third person view, asking the player to be an objective viewer.

The second part focuses on a first person view of the game, giving a more personal feel for the player. It suggests that they themselves are in a potentially coercive situation and the player is asked to respond. The player is first shown a negative outcome and then the scenario is repeated to show a potential positive outcome dependant on the players' responses. Through each of these scenarios, feedback was an important process that was considered. The facilitator of the session was to play an important role in helping to guide the process, give feedback and encourage class discussion throughout the game.

3.1.5 WP5: Efficacy trial

WP5 was carried out in accordance with Step 5 & 6 of the IM approach, developing an implementation and evaluation process to trial the game PR:EPARe.

In order to evaluate the game PR:EPARe, the IM approach required an evaluation strategy in which efficiency could be tested. SASH produced an evaluation design that would be a two-study approach which included feedback from both teachers and students. SASH chose to conduct a small-scale cluster randomised controlled trial in the first study which required the first section of PR:EPARe to be delivered in RSE lessons throughout the participating schools. The second study was a pre-post evaluation of both sections of the game. Conventional RSE classes were used as the control group of the trial. For a full report on the evaluation methods conducted by SASH please refer to chapter 5 or the HIEC project evaluation report by Brown et al. [7].

Knowing that this was the intended evaluation procedure that was to be deployed throughout schools, it was essential that the technology chosen for PR:EPARe reflected the availability of that in the school setting. By evaluating the chosen procedure, myself and the SGI's development team were able to reflect on the process of installing the end product and ensuring minimum technicality issues throughout evaluation.

Through the evaluation phase, feedback was gathered from the participating schools from both the students and practitioners. This feedback was used to develop necessary changes within the game to ensure that it met the intended criteria, and again fortify the iterative approach to the design.

By following the Intervention Mapping approach, the work packages set out by SASH, identified a process that refers largely to stakeholder input and theoretical evidence that sets out to consider the core user when developing a serious game. Using this iterative approach, whilst addressing each section throughout the research and development process, provided a fresh perspective on the best methodology for developing serious games as health interventions.

3.1.6 Critical Analysis of IM in Game Development

SASH's adoption of an Intervention Mapping approach for the development of a game based intervention, was based on the conclusion that this approach provides a framework for developing interventions which is grounded in evidence and theory. The IM approach describes a protocol that provides guidelines and tools for the selection of theoretical foundations and underpinnings of health promotion programmes, for the application of theory, and for the translation of theory in actual programme materials and activities. Key tasks are outlined into visual Steps to provide a logical and iterative planning process for developing the intervention.

Whilst IM has been shown to provide a useful tool in the application of developing interventions, [49] it was essential to assess how the approach would synchronise alongside other fields such as game development approaches, and how this would affect the decision to use IM in developing a new method for this research contribution. To approach this, development strategies are identified in the IM process that are similar to most games development processes.

Initially, one of the first notable aspects of the IM approach is that it is an iterative process [1]. Iteration allows existing systems to be deconstructed and reconstructed as information and feedback arise through a projects lifecycle. This allows developers and designers to create, test and then refine elements to become more suitable to the intended audience. More and more companies are adopting this approach to games and

software development, using Agile methodologies [54] that incorporate the same iterative process. A similar process outlined in both of these methods requires a high level of interaction with clients, stakeholders and users in the development process, and is often linked with the term participatory design/development [55]. Gathering user feedback through research and testing, fuels the iterative process by collecting data for later refinement of the product [56]. Whilst the majority of software developer research suggests that an iterative process with participatory design is essential, it is important to not get distracted and enter a continual loop of refinement, in which the project does not complete [57]. With many time restraints on game development companies, the iterative process can often be looked over at critical stages and thus time management becomes essential in the projects development cycle.

The IM approach outlines the first Step of its framework as titled Step 1: Needs Assessment, which incorporates the previously discussed use of participatory design, using stakeholders and planning groups to assess the health-related problem in question [1]. Programme goals are identified and are outlined at this stage and the ultimate aim of the project is defined.

This first Step shows similarities to the documents that games companies draw up in the planning stages of a game. Often titled Concept and Technical Specifications documents, they show a working list of pre-production information concerning the game. These documents show the developers the needs and the structure that the game is to take, in essence the vision of the game [58]. For both intervention planning researchers and games developers, the importance of obtaining clear project scope and identifying overall aims before a production commences is an obvious component in developing the subject matter. In light, this first Step appears to naturally exist within each field's development processes, which suggest a harmonious union when considering a combined development experience of these areas.

Step Two: Programme Objectives, of the IM approach, outlines the focus of the intervention by creating matrices of change. This is developed by creating performance objectives that will measure the effect of the intervention on the recipients against the intended programmes outcomes. This Step is designed to cover the development of the

conditions to be included in the intervention, in effort to show behavioural change against the objectives.

Since this Step is a purely health intervention approach, it seems initially to contrast to the working process of developing games. However, game development does seek to guide player emotion through careful development of game mechanics in order to achieve the desired state. The choices that the game designers work through at this early stage can therefore be likened to the choices made for the health intervention outcomes using an IM approach. Whilst behavioural change is an aspect that very few entertainment games designers are interested in, it is worth noting that games design and mechanics are nevertheless still chosen to create the maximum effect for the player emotionally. Although this Step lies outside traditional computer game design, it is possible to see similarities in the working process. Linking this to developing the gameplay and mechanics could aid the overall development of the player experience.

Step 3: Theory-based methods and practical strategies & Step 4: Programme Plan of the IM approach, show the development of practical strategies for implementing the intervention and brings the programme together into a workable case.

Step 3 states that planners seek theory-based methods and practical strategies to correspond to the change objectives set out in the previous step. These strategies set out the practical application of how the methods are delivered in the intervention.

Step 4 then informs the intended development team and target users of the projects developments before bringing these strategies together ready to be implemented in Step 5. Materials and plans are brought together and reviewed/piloted to ensure that they are achieving the full set of change-objectives.

These steps essentially translate to the practical planning processes that flesh out and define the project. From this, it is easy to connect these steps to a typical pre-production development phase in a games company. At this stage of a games development, concept and technical documents would be the normal progression and would show the intended development method. As with the IM approach, user research and feedback are gathered to ensure that the project is achieving the intended IM Step 3 & 4 and from this they have very similar translations to a game process. It is this in which these steps are the

planning stages which line out and prepare the intended outcomes and methods to deliver the project goals.

Step 5: Programme Implementation, of the IM approach, refers largely to developing plans of the project and identifying key individuals that are critical to the successful adoption of the programme. This step is perhaps one in the IM approach that coexists most naturally with a traditional gaming process as this is the creation stage. This is a core stage for both health-intervention and game project cycles, where the pre-production work is brought together to create the final product. This is also a stage where project implementation is assessed much like that of a games company gathering consumer information and utilising user research ready for delivery. This step translates naturally and requires little cross-over from IM to game development approach.

Step 6: Evaluation Plan, of the IM approach, identifies the interventions efficiency in achieving its programme and performance objectives.

Whilst this Step has a different meaning when concerned with entertainment games, the outcome of data collection for future work is a similar process. For example, entertainment games would be likely concerned with the overall ratings and sales of the game. This can arguably be said to be an indication of the games successful effect on the player, with ratings acting as an evaluation of the games attributes on the intended users. This data, positive and negative, is collected to inform future works for the company. With the IM approach, this Step in evaluation is a pinnacle point in determining the success of the programme, therefore more emphasis is placed on developing an evaluation plan. Each objective that has been previously set out must be measured in order to process the final results of the interventions efficiency. Whilst this step is an important process for health intervention and game development, there is far more emphasis placed in intervention evaluation that game evaluation. This is perhaps an area that game development could benefit from in order to provide in-depth data as to the effects of games on their targeted user audiences.

Whilst there are obvious differences between an IM based health intervention approach and a games development approach, the steps outlined in IM follow a fairly similar approach to a development process laid out in such technical frameworks as Agile [54].

Following a standard process of research, pre-production, production and evaluation, it is easy to see the cross-overs between the processes and how they could be fitted together to form one process. In light of its compatibility and the evidence presented, the IM approach presents a suitable case for its framework inclusion in support of a new method of health based serious games development.

3.2 The Four Dimensional Framework

The Four Dimensional Framework or 4DF was created by De Freitas and Oliver [3], as a response to the deficiency of evaluative tools for educational serious games. The framework was proposed as a guide to support a critical approach to serious game development and for tutors to evaluate the potential of using serious games in their practise [38]. De Freitas and Oliver note that although studies for evaluating educational games have been established in earlier research [26], [59], many of these are derived from entertainment and leisure games studies. The framework was therefore proposed in order to address the gap in research targeting specifically educational games and simulations. The authors pose that unlike previous guides to developing educational serious games that use terminology which is central to the field of games design, the 4DF and its terminology will be created with educationalists in mind.

To address the need of introducing the framework outlined by the authors, a look at what questions are posed by tutors before introducing serious games into the learning environment was undertaken. The questions found are outlined below:

- Which game or simulation to select for the specific learning context?
- Which pedagogic approaches to use to support learning outcomes and activities?
- What is the validity of using the chosen game or simulation?

With these questions in mind, the authors state that the framework incorporates a triad of features that are common in the works of serious game design frameworks: the student, the teacher and the tools/resources available [3]. These three features are then extended to include the representational issues of the game world that make up the four dimensional framework. The four dimensions are broken up into context, learner/learner group, the internal representational world and process of learning/pedagogy. The figure

below shows the four dimensions of the framework. The authors offer an analysis of the four dimensions which is described below.

Four Dimensional Framework	
Learner Specifies	**Pedagogy**
Profile	Associative
Role	Cognitive
Competencies	Social/Situative
Representation	**Context**
Fidelity	Environment
Interactivity	Access to learning
Immersion	Supporting resources

Figure 10 Four Dimensional Framework [3]

3.2.1 Context

The context section of the framework draws focus to the environment in that the learning is to take place. This includes delivery methodologies, access to learning and support, resources available and tutor background. The role of learning context and its possible issues are important to consider and no more so than in the area of e-learning applications [39]. The authors present that context is paramount to understanding the learners needs and can either prove to be an enabling factor for learning support or provide a problematic weakness in the e-learning application due to lack of research in this area. By addressing contextual issues early on, such as where will the learning take place? The application can be developed to fit into the appropriate situation, such as a school environment.

3.2.2 Pedagogy

This section focuses on the formal and informal learning process and promotes self-reflection of the practitioner and their methods. Many theories of experimental learning have been developed that encourage embedding learning content into technology such as the constructivist theories [60] and Kolb's experimental theory [61]. Providing support in addressing approaches to e-learning strategies, this section examines what theories are being used, how they are applied through curricular activities and how they can be supportive for both the learner and the practitioner. In serious games this is a

vital area to address to validate that the content is embedded, appropriate and that learning outcomes are achieved.

3.2.3 Representation

Representation in the four dimensional framework refers to the diegesis and technology of the game/simulation in which the player and practitioner engage in the learning activities. The authors state that this section is one of the most significant areas to develop as player immersion, alongside critical self-reflection techniques are first addressed when determining how to represent the e-learning content [62]. Within the representation division fall such issues to consider when developing serious games as player immersion and fidelity, game based technologies and uses, interactivity and usability studies. The supporting role of the game world, both inside and out should provide a unique learning area in which to support the overall learning outcomes and objectives.

3.2.4 Learner Specifics

Within the framework, the learner specifics section refers to the focus on the learner or learner group and certain attributes that could influence their learning and development. The specifics can include age, gender, learning background and takes into account the diversity of environmental factors that could influence the learner's development. This component was included as previous research by Mayes and De Freitas, [63] and indicated that significant support for learners with diverse abilities and skills could be offered via the medium of digital games and simulations. By focusing on the learner and their attributes, e-learning can be tailored to support the target learning group.

Each of these four components provides a map that guides the researcher in their development cycle. The learner specification links to the subject, the pedagogy links to the context to form a tool in development of serious games and simulations. Overall the 4DF proposes a model of pedagogic theory that draws focus on developing and evaluating digital education tools and immersive learning experiences.

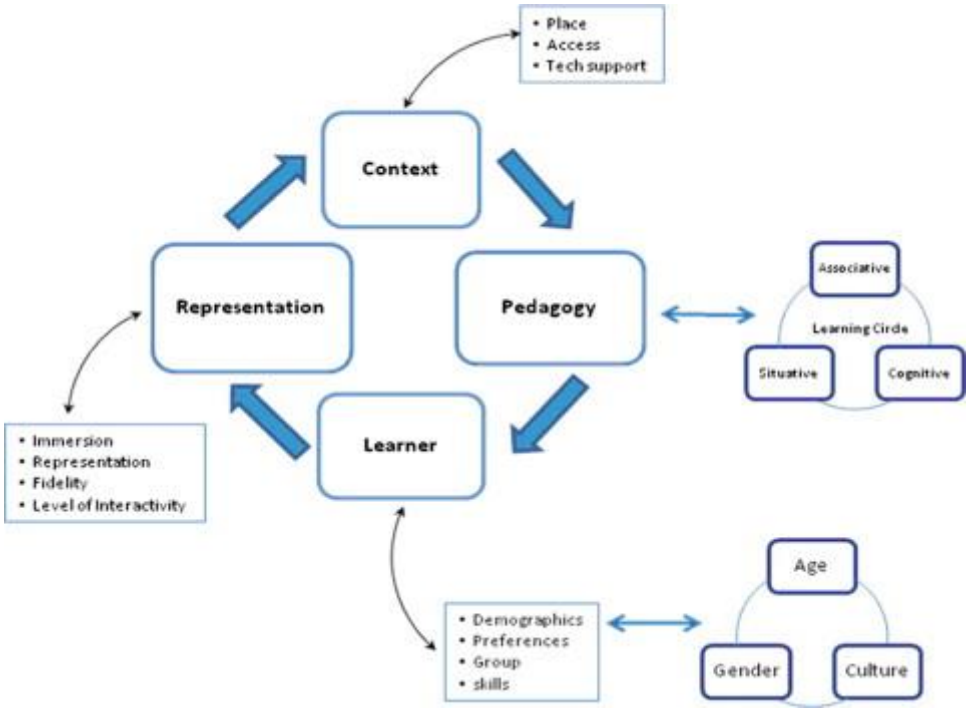


Figure 11 Model of Pedagogic Theory [64]

The 4DF was a four year research and development project that was commissioned by the Serious Games – Engaging Training Solutions (SG-ETS) and was partly funded by the UK Department of Trade and Industry (DTI). Partners on the project included the TruSim division of Blitz Games, the Vega Group PLC and three research universities, the University of Birmingham, the University of Sheffield and the University of London. The requirements of the project were to build serious game prototypes that adopted the user's learning needs across medical and military fields [62]. This would lead to creating a set process that could be referred to when considering the outcomes of a serious game, leading to researchers and developers making informed choices that are effective at addressing the needs of the target audience.

One of these games took a closer look at infection control in acute healthcare, after research into a significant rise in MSRA and infections in hospitals between 1993 and 2004 [65]. Using a development process guide shown below in figure 12, that incorporates the analysis of learner group surveys, interviews and focus groups, the guide shows the method that was undertaken, providing the research into developing a game for infection control.

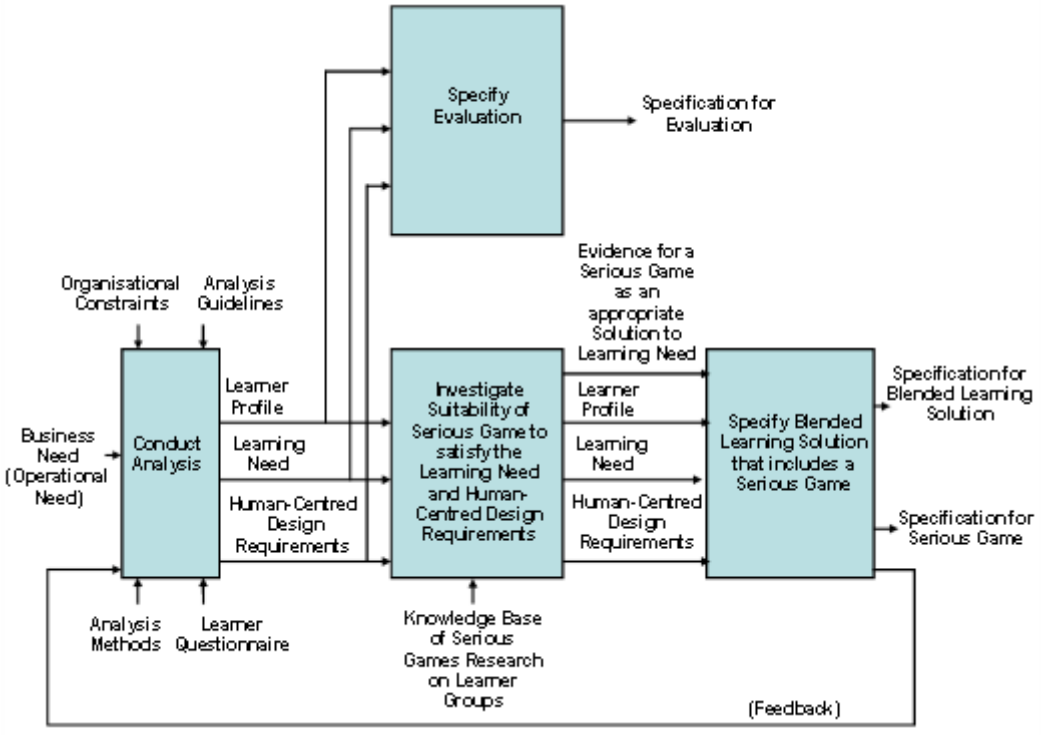


Figure 12 Development Process Guide for Serious Games [64]

In the instance of developing a serious game for infection control, the researchers found that embedding learning content into a simulation could be effective if additional material that covered reflection, topical discussion and debriefing were available alongside the tool [62]. The results from the pilot feedback show that from the three third year groups that trialled the experiment, the 24 respondents gave feedback showing that 83% enjoyed using the package and 91% felt that using it was an interesting way of teaching infection control [66].

Following on from this research, De Freitas and Jarvis developed a checklist that would aid in applying the framework by listing the different factors to consider when choosing and evaluating e-learning tools and what may determine and aid the educational process. The checklists shown below in figure 13 show the factors and guide questions to consider in each of the components of the 4DF.

Context	Learner Specification	Pedagogic Considerations	Representation
What is the context for learning? (e.g.: school, university, home or a combination.)	Who is the learner?	Which pedagogic models and approaches are being used?	Which software tools or content would best support the learning activities?
Does the context affect learning? (e.g.: level of resources, accessibility, technical support)	What is their background and learning history?	Which pedagogic models and approaches might be the most effective?	What level of fidelity is needed to support learning outcomes and activities?
How can links be made between context and practice?	What are the learning styles/preferences?	What are the curricula objectives? (list them)	What level of immersion is needed to support immersion?
	Who is the learner group?	What are the learning outcomes?	What level of realism is needed to achieve learning outcomes?
	How can the learner or learner group be best supported?	What are the learning activities?	How can links be made between the world of the game/simulation and reflection upon learning?
	In what ways are the groups working together (e.g.: singly, partially in groups) and what collaborative approaches could support this?	How can the learning activities and outcomes be achieved through existing games or simulations?	
		How can the learning activities and outcomes be achieved through specially developed software (e.g.: embedding into lesson plans)?	
		How can briefing/debriefing be used to reinforce learning outcomes?	

Figure 13 4DF Checklist [62]

This checklist is an essential guide to determining key issues in learner context and pedagogic considerations when choosing a serious game and lays out the fundamental questions that should be considered before applying it for educational use.

An applied example of the above checklist and the 4DF framework was used in the research and development of *MediaStage* [67] , an application to support learners in media studies education at GCSE level. *MediaStage* is primarily software that models human behaviour in the environment of a 3D television studio in an effort to engage secondary education learners. The user is given complete control of a simulation like environment, in which they can choose the characters, set, lighting and narrative of the production [67]. This content creation tool allows the user to experiment with creating a theatrical virtual world in which they control and in turn encourages the user to learn in a constructivist approach.

Applying the 4DF and the checklist to *MediaStage,* the researchers produced the following results found below in figure in aid of the evaluation stage and to support development of learning outcomes.

Context	**Learner Specification**	**Pedagogic Considerations**	**Representation**
School-based learning in media studies.	School learners 14-16 year olds are currently using this tool.	Use of theories such as Kolb's Experiential learning (1984) where learners learn from experience through abstract conceptualisation and application into practice.	MediaStage uses a medium level of fidelity based upon the use of 3D animated characters.
Class-room based.	The tool is used primarily for GCSE level but can be used by other ages and in informal settings.	Learning outcomes: Conversancy with film craft and approaches allowing the student to experience the process of film and stage craft first hand.	MediaStage uses a high level of interactivity between the media world and the learners own experiences and knowledge, allowing the student to develop an increasing conversancy with the rules and functionality of the simulation tool.

Context	Learner Specification	Pedagogic Considerations	Representation
Interactions with the software.	The tool can be used by learners working singly and in groups.	Learning activities: The student learns through activities based upon directing a play/film.	Learning activities and outcomes achieved through specially developed software supporting an increased awareness of the learner and the processes of stagecraft and film making through increased usage.
MediaStage tool supports GCSE Media Studies curriculum.	Range of differentiated learners with different learning styles can be catered for through the use of this tool as each learner or learner group can engage with the resource according to their own preferences.	Briefing/debriefing: pre-class preparation and post activity reflection and consideration.	
		Simulation embedded as a practical session into the lesson plan of the tutor. Individuals will need different levels of attention from the tutor at different stages of the learning process.	

Figure 14 4DF Completed Checklist for MediaStage [62]

By filling out this checklist the authors, De Freitas and Jarvis, state that the table highlights potential challenges and supports tutor reflection on the informal and curriculum-led learning advantages of the tool [62]. This can be used to aid in the iterative design and development process by providing a standard to which the development team can refer to as not to deviate from the original objectives of the game or simulation. Furthermore feedback gathered from focus groups can be paired against these original aims to maintain consistency in the tool's development.

Whilst the 4DF was initially developed to aid the practitioner in the serious game selection and evaluation processes, it has become a serious game designer's resource in which pedagogic considerations and game design elements are brought together. The 4DF provides a foundation for the consideration of bringing an educational design strategy to game-based learning and paved the way for the authors' later serious-games design model found below in figure 15.

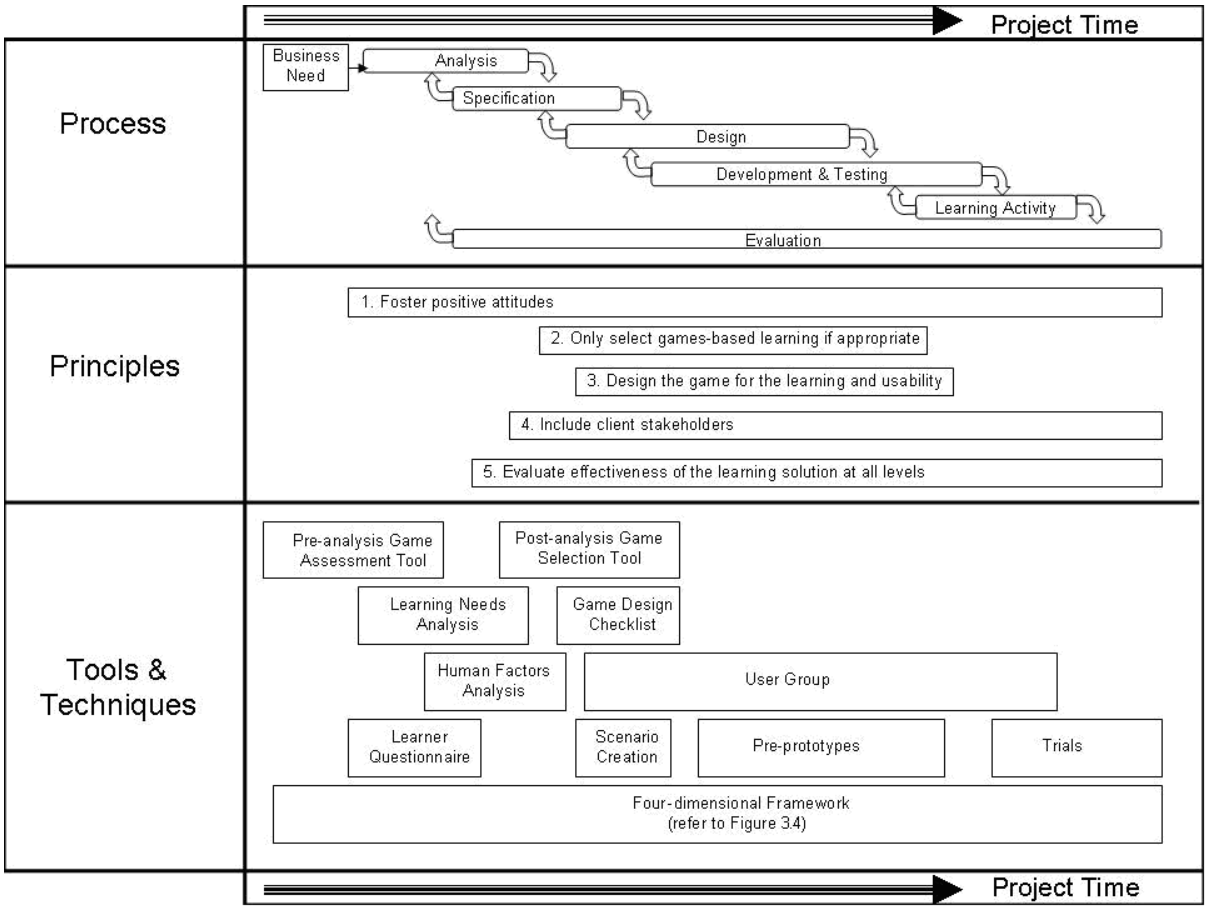


Figure 15 4DF Serious Games Design Model [63]

3.2.5 Critical Analysis of the Four Dimensional Framework in Game Development

A key process concerning user groups and practitioner roles are addressed in the 4DF and thus made it stand apart from the other serious games design frameworks. These were issues that the researcher wanted to address and felt that serious games were often too learner focused and thus designed without much thought for the educationalist delivering them. The adoption of the 4DF in this research was therefore founded on the

recognition of the relationship between the student, teacher and resources that the framework emphasised and built upon. This relationship was one that many serious games frameworks often skipped over or ignored by concentrating solely on the student and the resources. By acknowledging the tutor, the 4DF presents a different account and a different perspective on how to create and analyse serious games.

The 4DF process is written with the tutor in mind, and attempts to address potential concerns and provide solutions concerning validity, deployment, usability and testing. As the 4DF is conducted from an educationalists view, the question of what the important aspects of serious games are shifts, and in doing so brings to light a new user group. In response to the needs and wants of the educationalists outlined in the 4DF, it is essential to work with and design for two target user groups when developing serious games. One target user group should fulfil the role of the student or learner, incorporating the ideals of user motivation, learning theory and feedback, whilst the other group should fulfil the role of the practitioner, with design centred on ease of use, validity and evaluation. The acknowledgment of the different needs through the 4DF indicates that the current development methodology of serious games is perhaps too learner centric and needs to also address issues that practitioners may have whilst delivering serious games.

The 4DF is divided over four areas that the authors believe need to be considered and addressed in the development of a serious game. The areas; Context, Learner Specification, Pedagogic Considerations and Representation are analysed in the next section to evaluate their relevance to the serious games design and development process.

3.2.5.1 Context

The first section is identified as Context in the 4DF and it draws focus on building and supporting the learning environment and developing resource access for the learner. One of the interesting approaches of the 4DF is that it addresses the environment outside of the virtual game space and identifies the importance of ensuring that the game is shown in an appropriate setting and provides sufficient resources for the learner. The questions that are asked in the 4DF checklist provide the developer with the

ability to assess the importance of the games context and how the design should incorporate this information before development.

- What is the context for learning? (e.g.: school, university, home or a combination.)
- Does the context affect learning? (e.g.: level of resources, accessibility, technical support)
- How can links be made between context and practice?

The above questions are there to identify information for the context development of the serious game but it is important to note why this information is relevant to a developer.

To answer this, we can view the questions and subsequent data in a similar fashion to development research conducted for entertainment games. The above questions intend to extract data such as to where the game is intended to be deployed such as a school or college environment. In entertainment terms this is an equivalent method of gathering data for the use and understanding that a game is intended to be released as an off the shelf hardcopy or if it is to be released via a download platform. Releasing a game as a downloadable version presents different development challenges than developing a game for a console platform. By addressing these differences early the developers can adopt the games development style to suit the game. This reasoning also applies to serious games and context could be considered a vital function when assessing the role that the game will play in an educational environment. Ensuring that the game meets the delivery and technological requirements is the first step to providing an effective game-based learning experience.

Resource development is a field highlighted in the context section of the 4DF, a topic often overlooked in serious games development due to a tendency to want the entire learning experience delivered virtually. However, other non-virtual resources could provide greater support to operating and delivering a serious game much like hard-copy operation manuals and maps used to be the norm for use in earlier entertainment games. Developing a similar operation manual for a serious game could go some way to help practitioners understand the workings of a game and thus improve perceived ease of use and easing possible fears.

By addressing potential practitioner fears of using and delivering new learning technologies in the classroom, additional support such as a manual could go some way to dispelling these fears and further acceptance of serious games as beneficial learning tools. Resources outside of the game environment could also benefit the learner by providing a similar guide to the game or be used to help evaluate the game. With further research into external resource development that compliments and supports serious game, researchers could look to tackle issues of usability, additional information support and evaluation that some serious games face.

3.2.5.2 Learner Specification

The second section of the 4DF looks at the intended learner or user of a serious game and looks to highlight the learner needs by asking certain questions like those found below.

- Who is the learner?
- What is their background and learning history?
- What are the learning styles/preferences?
- Who is the learner group?
- How can the learner or learner group be best supported?
- In what ways are the groups working together and what collaborative approaches could support this?

These questions highlight the importance of designing a game to reflect the learner's needs and covers the basic user research needed to create a successful serious game. This section is similar to the user research conducted by entertainment games companies to assess what the target user expects of the game.

An important aspect of this section of the 4DF is the focus on identifying the background and learning history of the intended user group. This information can highlight key data vital to a serious games development process such as what is the age group of the users and what learning style should be adopted. By asking questions such as what is the preferred learning style, the developer can tailor the games mechanics to suit the intended learning style. For example, if the learning style incorporates role-play

elements then the developer can work that into the game-play capitalising on story based scenarios or character role-play.

This section also emphasises whether the game should be built for single player use or as a more collaborative group play style. Just this piece of information alone can dramatically change the way in which the design of a game would be considered. For example, a serious game targeting single players might lead the designers to use game-play and mechanics such as narrative and character based decisions to achieve an emotional connection between a player and the game. A group targeted serious game might consider a more competitive stance with the game-play targeted at achieving a sense of rivalry between players for the emotional connection. Whether the game is to be a single or multi-player game also has significant impact on the way that the game will be delivered and thus affecting a games user interface and interaction design. As a result, this is a core element to establish early on in the pre-production stage of a games design, serious or entertainment.

3.2.5.3 Pedagogic Considerations

This section of the 4DF takes into account the pedagogic aspects of the serious game. It highlights learning approaches, curricular objectives, learning outcomes and principle reinforcement, as some pedagogic considerations to take before designing a serious game. As this section is wholly concerned with an element that is not traditionally considered in entertainment games design, it is difficult to draw conclusions to the benefit that this plays on the game itself in terms of traditional game design and development. However viewing these considerations from an educational stance, the 4DF considers questions that would be automatically asked when outlining a lesson plan. Questions such as those shown below, identify the educational needs and objectives that are to be undertaken and further outline how to meet those objectives by creating appropriate learning strategies.

- What are the pedagogic approaches?
- What are the learning objectives?
- What are the learning outcomes?
- What are the learning activities?

As previously seen in the research on serious games attitudes, see Chapter 2, Section 2.2.1, there are many opinions of the role that pedagogic content should take in serious game. Many believe that the educational content should be discreet and play a secondary role to the entertainment values, whilst others believe that players should be fully aware of the learning content and use it to help the process of self-reflective learning. Either way, it is vital to establish the purpose of a game. Setting out the purpose or in this case the learning objectives, allows the developer a basic premise in which the game can be built upon. Like entertainment games, there needs to be a purpose or an end goal in which the player achieves something from playing the game if only in the most basic form a sense of completion.

In serious games, the learning objectives leads the purpose which makes the pedagogical considerations section of the 4DF a vital part of the whole process. By outlining the objectives, learning approaches can be identified and matched to game mechanics to achieve the intended outcome. For example, a serious game is tasked with providing a learning outcome in which the student experiences a first-hand approach to directing a play. In response to this objective, Kolb's Experiential leaning theory (1984) is adopted in which the student learns through experiences of practical applications. In terms of adopting this theory into a game mechanic, the developer could then choose to build a simulated environment or choose to develop character based role-play scenarios. Ultimately, addressing the pedagogic considerations as the 4DF suggests, determines the principles in which the game must present if to provide an effective learning tool.

Often one choice informs another and this is a common practise in games design and development where choices such as genre will generally affect the developer's decision in adopting certain mechanics or a style. The pedagogic considerations section provides a similar outlook in which early decisions influence other game functions. A choice made as to the learning objective will lead to a decision concerning learning approach/theory and eventually will lead to a decision concerning suitable learning activities. Each of these decisions will affect the game-play, style, mechanics and overall effect that a game has on a player and as such are important aspects of consideration in the planning process of a serious game.

Finally, it is imperative that a serious game is educational and that the learning content is accurate and is delivered in a suitable manner to the target audience. This section of the 4DF draws attentions to some of the most important questions that researchers and developers should be asking whilst creating the learning content for a serious game. Without clear objectives, there is no determinant outcome in which a serious game can be measured for validity and as such, an evaluation would prove to be a most difficult task. By following these series of questions concerning the pedagogic features, a clear rationale of a game emerges and directs the researcher/developer to make game design decisions that complement the pedagogic choices in order to bring together a game that preforms logically where both entertainment and education are concerned.

3.2.5.4 Representation

This section of the 4DF concerns itself with the technological considerations of a serious games design and development. Questions concerning what software to use and what level of fidelity the game environment should encompass are covered in the representation section in order to achieve symbiosis between technology and the player.

On a very basic level, the technology that is to be used to create a game is a significant point to consider whether developing an entertainment or a serious game. Considerations such as what hardware and software to use can greatly affect the outcome of the game. For a serious game there can sometimes already be restrictions set out by a school or a learning academy in terms of how advanced the hardware is that they have to deliver the game on. This can mean the difference of developing a game that is suitable for a PC over developing a game suitable for an IPad, which has a very different approach in terms of design and user interactivity. These factors need to be considered carefully before development because of the effect that this will have on the design decisions based on player usability, interactivity and ultimately the overall design of the game itself.

Whilst hardware is an important factor, one of the other considerations raised in the representation section is what software to use when developing a serious game. Software packages can have a substantial impact on the decisions taken by the developers concerning the programming approach and the visual direction that a game

should take alongside other factors. Cost is also an issue to contend with in games development as many software packages range in price, often costing thousands of pounds. In light of this, developers may wish to create a 2D game, which are often considered quicker to produce and cheaper than a 3D game, in an attempt to keep production costs down. Another consideration might be the relationship that the software has with the intended hardware that the game is to be deployed on. For example, the software Adobe Flash that is used quite often for creating 2D images and animations is not compatible with Apple products such as the IPad and the IPhone.

Taking these aspects into account that are raised within the representation section of the 4DF, can allow for the developers to make smart decisions based on the technological needs and how these decisions come together to create a practical game. Additionally, specialist hardware or software may need to be considered when developing a serious game. This can range to hardware chosen specifically to help a target user group such as the disabled or disadvantaged to engage with the game, to incorporating hardware that monitors brainwaves and cognitive functions in order to help evaluate and track a games effect on a player.

Considered one of the most important areas by the authors of the 4DF due to the focus it draws on developing player self-reflective learning by determining how to use the information gained from a game, and apply it in a real-life situation. One example of how this is achieved is by adopting a simulation design approach. If learning content is to be delivered through role-play based activities then often a simulation style, a game style that combines realism and high fidelity to mimic real life scenarios, is adopted. By using a simulation approach it is a generally accepted view that the realism of a game world is a sufficient mimic to the real world and thus provides the learner with a direct visual account of how to apply learning content from simulation to the physical world.

This direct account between the two is thought to provide one of the most beneficial self-reflected learning states for the player as they can directly apply the knowledge gained without processing through additional layers of subtext often found in games. However, regardless to the effectiveness of a simulative approach, simulations are often queried by games researchers and designers as to whether they fit within the terms of serious games due to the lack of game like qualities. Whilst this is an ongoing debate it

is important to address that the representation section of the 4DF highlights such issues of game realism and fidelity and links them to player reflective learning.

In summary, technological considerations are the backbone to any process concerning games development. However, there is more to the representation section than questioning what platform a game is to be delivered upon and whether the game is 3D or 2D? The 4DF puts forth an argument for the consideration of the significance that representation and technology holds on affecting a player's interaction, and questions the usability of a game for the target audience. Difficulties or poor choices made concerning technology could mean the difference between a positive and a negative experience with the user. This is turn could result in learning content not being delivered effectively or being lost in translation and thus means the serious game has failed to achieve its learning objectives.

The 4DF is one of the first frameworks that have been developed to address the considerations of developing a serious game. Research has shown that it can be used to underpin the design process behind combining game based principles and pedagogic content [64]. However on its own the 4DF does not provide enough guidance into traditional game design considerations such as usability, gameplay and mechanics which requires further consideration in another design methodology for a comprehensive analysis.

3.3 The Mechanics, Dynamics and Aesthetics Framework

The Mechanics, Dynamics and Aesthetics (MDA) framework was developed by Hunicke, LeBlanc and Zubek as part of the taught program at the Game Design and Tuning Workshop at the Game Developers Conference, San Jose 2001-2004 [2]. The MDA offers up a methodology for understanding games design, and attempts to bridge the gap between the game developer and the player experience. Hunicke et al. propose that creating an iterative design process ensures a quality final design and that analysis is essential for determining the overall significant impact imparted to the player.

Hunicke et al. wanted the MDA to 'bridge the gap between game design and development, game criticism, and technical game research' [2]. As a result, the MDA looks to encompass a development methodology that is relevant for games designers, developers and researchers as each process created is merged to form the final gameplay. Combining the various packages of work generated by a development team into the development cycle, requires a translation from each area, from code and AI to design and user experience. By using this method, the MDA offers itself as a production tool to aid understanding and creating a coherent approach to the game development cycle. An analysis is then used to inform and support the iterative cycle of development, leading to a refined end design.

According to Hunicke et al., games are consumable goods that are purchased, used and then disposed of by the player. Games more so than other media can create complex emotional responses within a player, which can "create complex, dynamic (and often unpredictable) behaviour" [2]. The framework suggests that games are designed to build behaviour through player interaction and that "the content of a game is its behaviour – not the media that streams out of it towards the player" [2].

To begin to understand this relationship, the MDA formalises a game into three components, rules, system and fun. These three components are then translated into their design equivalent, Mechanics, Dynamics and Aesthetics. The figures shown below indicate this relationship.

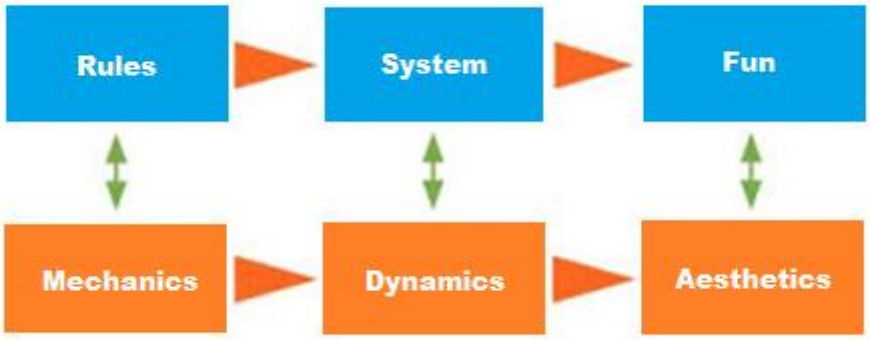


Figure 16 MDA Component Relationships [68]

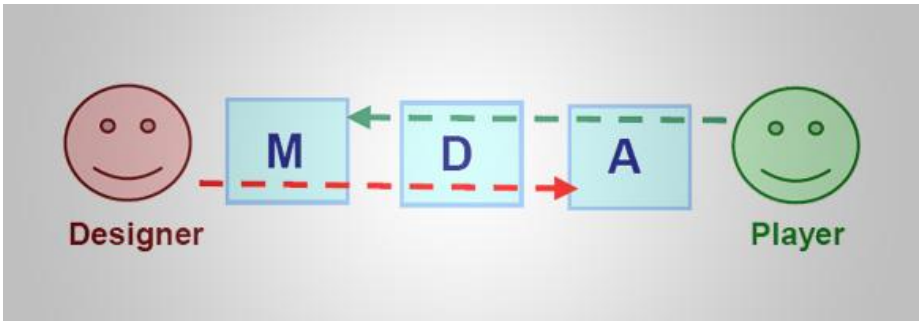


Figure 17 MDA Designer and Player Relationship [2]

From this deconstructed point of view, the figures shown represent the fundamental structure of a game presented in the MDA, and the overall relationship process between the structure, designer and player. These components are broken down further and are explained by Hunicke et al. as follows;

- Mechanics - describes the particular components of the game, at the level of data representation and algorithms.
- Dynamics - describes the run-time behaviour of the mechanics acting on player inputs and each other's outputs over time.
- Aesthetics - describes the desirable emotional responses evoked in the player, when she interacts with the game system. [2]

Whilst the creator works from the mechanics up approach, developing player behaviour output from interactions within the dynamics of the game, the player determines value throughout the aesthetic or emotional response that a game offers and learns to appreciate complex mechanics at a later stage. By breaking down the components of the MDA, the creator can consider the player experience from an aesthetic point of view and consider what is the element of 'fun' within the game, and what is likely to drive the player forwards in play. Provided below is an in-depth discussion of the individual components for a greater understanding of each area, from the perspective of the player or as Hunicke et al. state the 'experience-driven rather than feature-driven'[2].

Aesthetics according to Hunicke et al. [46] is the representation of what makes the game a 'fun' experience for the player. In an effort to define 'fun', the authors offer up a taxonomy that they state is not limited to but include specific player experiences that fall within the category of 'fun'. The taxonomy presented below shows the eight experiences that the MDA recognises that a player can hope to challenge throughout the lifecycle of a game.

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

Figure 18 MDA Aesthetics Table [46]

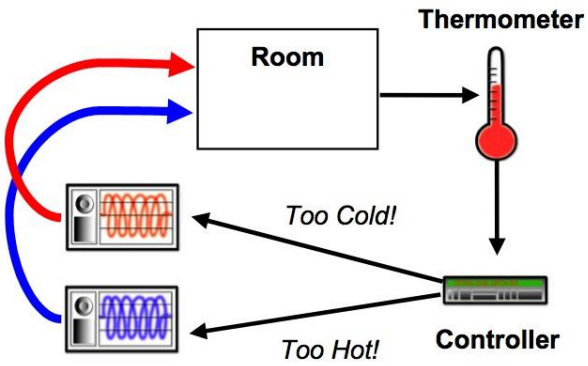
Whilst Hunicke et al. do make a point of addressing that not all experiences are listed in their taxonomy, it is interesting to note that Wolf [69], a professor and leader in his field of games theory, identifies 42 genres in computer and video games alone, that provide aesthetic player experience. The MDA however, endeavours by creating a basic

taxonomy that begins to address the fundamental questions a designer seeks, why do different games appeal to different people and how is that harnessed within the player experience?

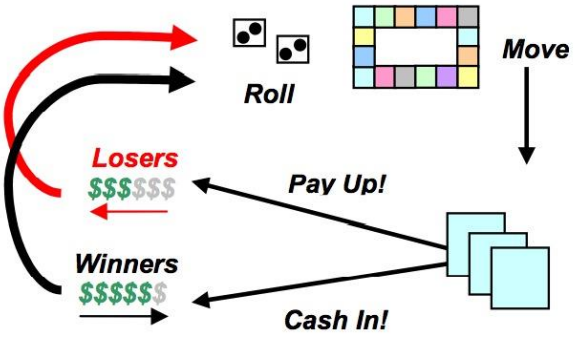
An example set out in Hunicke et al. paper is the case of '*Monopoly*', the family board game which has sold over 250 million copies worldwide since 1935 and still remains a firm favourite in the family household [70]. The object of the game is simple, become the wealthiest player and bankrupt your opponents by renting, buying or selling property. '*Monopoly*' is a game of chance, strategy and people skills, this makes the game-play for the most part unpredictable, and favours those players with luck. As a result, once a leader reaches a certain point in the game, it becomes very difficult for any other player to catch up to him/her. Hunicke et al. state:

> *"In Monopoly, as the leader or leaders become increasingly wealthy, they can penalize players with increasing effectiveness. Poorer players become increasingly poor."*

This is a flaw in the games design that is frequently expressed, and one that leads Hunicke et al. to discuss that by examining the aesthetics and dynamics of the game, tweaks can be made to the games mechanics in order to 'fix *Monopoly*', by ensuring dramatic tension and agency is not lost [2]. Using the MDA approach, the aesthetics of *Monopoly* could be narrowed down to Expression, Challenge, Competition and Fellowship. Introducing competitive aesthetics in to the games design encourages the player/s to be emotionally invested in order to obtain the lead and secure the desired victory. As it stands, tension is lost when a player feels that there is no longer any competitive element due to winning or losing and being placed at either end of the scale. Shown below, Hunicke et al. pose this in two diagrams that show the dynamic player feedback gained from the traditional interaction of the player and mechanics of '*Monopoly'*.



A thermostat, which acts as a feedback system.



The feedback system in Monopoly.

Figure 19 MDA Feedback System in Monopoly [46]

These diagrams show that the player feedback received in traditional *Monopoly*, whether experiencing the winning or losing condition is likely to cause the player to become disengaged with the game. This could be linked to Csikszentmihalyi's theory [42], in that there is no balance or 'Flow Zone' in which the game either challenges the player or it becomes too difficult to compete with the other players. Tracking feedback through the dynamics and aesthetics of the game allows the designer to develop and adjust the mechanics in order to create a greater sense of equilibrium within the gameplay. Adjusting the mechanics of *Monopoly* with this method could then increase the overall playability by ensuring players are engaged and motivated for longer periods, achieving the 'Flow Zone'. Through this methodology of working design, the MDA provides an iterative approach to development, in that feedback is constantly being tested and tuned to provide an enjoyable player experience.

The MDA although created originally with entertainment games in mind has been used as a fundamental point for assisting development in educational serious games. Aleven et al., used the MDA in their development of a new educational game design framework, in which they could 'analyse how the game's mechanics, dynamics, and aesthetics relate to its learning objectives (or learning content)' [71]. Additionally, Bergström et al. propose the MDA framework as the predominant design tool to use when assessing gameplay design patterns in order to achieving player aesthetic camaraderie [72].

However, whilst the MDA allows the developer to develop an iterative way of working, Vorderer and Bryant [73] suggest that a developer risks falling into a continuous development cycle, searching for the optimal combination of mechanics, dynamics and aesthetics by using this method. They suggest that whilst the method, offers up a sought after evaluation tool for the game design process, it is important that designers should also look to their intuition when dealing with the creativity and vision of the overall game [73]. With this in mind, it is important that the MDA framework is used as a guide to help break down the development cycle and used to develop player feedback into development without diminishing the games creativity or higher level function.

3.3.1 Critical Analysis of the MDA Approach

The Mechanics, Dynamics and Aesthetics approach is considerably different to the previous methods outlined, the Intervention Mapping approach or the Four Dimensional framework. Both the IM and the 4DF methods contain steps or approaches to creating and delivering learning content, the MDA method however, does not cover any educational content and is wholly dedicated to the field of games design. It is also the only method out of the three which focuses on one subject area unlike the IM and the 4DF that brings together multi-disciplines such as education, health and games design. For this reason, the MDA approach feels less clinical in terms of a design methodology and instead creates a dedicated argument for games design principles rather than cross-examination of a multitude of subject areas. Of course, this on its own is not a beneficial methodology to the study due to the multi-disciplined research that a serious game entails, but looked at in part alongside the IM and the 4DF it gives a solid understanding of some of the key areas to consider when designing entertainment games.

3.3.1.1 The Mechanic, Dynamic, Aesthetic Switch

The MDA is split into three areas for consideration when developing games; the first is Mechanics, the second is Dynamics and the third, Aesthetics. Alongside this, is a basic guide that represents the developer to player relationship using the three features, mechanics, dynamics and aesthetics.

The Mechanics section refers to the design of game components represented at its base level of data and algorithms. Mechanics are generally thought of as the backbone process in creating a games design and are used to create the rules in which a game is built upon.

The MDA lists mechanics alongside that of a relationship scale that puts it as the key point, according to the authors, that game developers are expected to prioritise before other aspects when designing a game. Traditionally, this has been the case as developers need to create a set of rules and systems in which the game is sound and will operate as planned, before considering or developing other concepts. Whilst mechanics are considered a necessary initial practise in game development, the MDA proposes a different approach for developers. The authors define this approach as the aesthetics of a game and it seems to revolve around a simple question, what will the player experience?

The Aesthetics section is the third section of the MDA approach and is suggested by the authors to be one of the major areas in which games design goes wrong. This thought is largely due to a designer's tendency to overlook player needs/wants and instead focus game design to fit their own ideals and wants. Adopting the process as suggested by the MDA, of establishing the aesthetic values of a game first, presents the developers with a very different method of designing games.

To consider this from a designer's perspective, the idea of establishing user needs/wants early on in the design process before mechanics design has been considered, is equal to an effective use of user research and understanding. However, the MDA goes further to suggest that it is not just sufficient for the developer to understand that the target user group is 15, male and wants a first person shooter, as these pieces of information are at best superficial wants. In order for exceptional design practise to take place, the developer must go further to question the experiences that are being created for the

player and understand what it means to create that experience successfully. Addressing the aesthetics or what the authors term as 'the fun element' of games primarily allows the developer to assess what is the 'fun' in games. The authors offer up a taxonomy of some of the experiences to consider, including fantasy, challenge and discovery. These experiences are what the developer strives for to create in order to make a game interesting and instil an emotional connection between player and game.

To consider this in terms of a serious games design method it makes a lot of sense when we consider that one of the principle obstacles that developers face is ensuring that the target audience will engage with the game. Adopting this style of development could go some way to solving this conundrum, by recognising that it is not merely enough to place educational content within a series of mechanics and expect the users to engage with the product just because it is termed as a 'game'. It stands to reason that if the users are to engage with a game then the game experience should be fun and in order to achieve this state then a game needs to fulfil the player needs.

By establishing the experiences that a game is to create for a player, the developer can design suitable dynamics and mechanics that fit in with the intended feel of the game. For example, if the developer wanted to create a sense of competition within the user group following research evidence that the users will respond to this experience positively, then they can invest in creating the appropriate dynamics for the experience.

Dynamics according to the MDA are the behaviours of the mechanics acting from the player inputs. These dynamics are what create the game-play experience for the player in the game and ultimately have a function in capturing a player's attention and maintaining engagement. As such the dynamics, or the interaction between the player and game environment, is an area that needs to be carefully developed in line with the experience or aesthetics that the developer is trying to recreate for the player. Only from this process, the developer can then create game mechanics that compliment both the aesthetic and dynamic qualities in an effort to create an appealing and entertaining game.

The MDA methodology offers up a very simple but effective approach to readdressing the way that game designers approach games design. By approaching the design with

the player in mind from the offset, designers can look to create games that are more suitable for the target audience. Serious games however, are often too involved with insuring that the learning content is correct or that the correct learning styles are embedded into a games delivery. Applying the MDA method could improve serious game developers considerations and open up awareness on the importance of delivering a game that is not just educational but goes further to provide a fun learning experience for the player.

3.3.2 Relationship Overlap between the Frameworks

Each of the three frameworks chosen to assist the development of PR:EPARe, had multiple methods in common, which allowed synthesis between the models. Shown below is a table that highlights and brings together the commonalities between the methodologies.

	IM	4DF	MDA
Participatory Design	x	X	X
Iterative Design	x	X	X
Needs Analysis	x	X	X
User Involvement	x	X	X
Pedagogic Strategy	x	X	
User Engagement Strategy	x	X	X
Concept Planning & Development	x	X	X
Resource Development	x	X	
Evaluation Strategy	x	X	
Technological	x	X	

Considerations			

Figure 20 Table of Overlapping Aspects of Three Methods

3.3.2.1 Participatory Design

One of the methods that appeared in each of the frameworks suggested a participatory approach to the design process.

- The IM approach suggests that in order to create an effective intervention design, researchers should work alongside stakeholders, clients, focus groups, practitioners and intended users throughout the process of development.
- The 4DF suggests that practitioners should be part of the development process of serious games and the importance of using focus groups for user feedback.
- The MDA focuses heavily on the role of the player/target user group and states that the player input plays a vital part in the design process.

The method of participatory design was applied and carried out as a result of the invested interest from each of the methods. The developers adopted this approach by ensuring that researchers, designers, stakeholders, practitioners and end users were all involved with the planning, design and development processes of PR:EPARe.

3.3.2.2 Iterative Design

Each method showed the use of an iterative design process to aid development.

- The IM approach indicates that an iterative process can be used to incorporate user feedback and testing to enhance the final product.
- The 4DF suggests using an iterative approach to ensure that the final product meets the overall learning requirements and relates to the end users.
- The MDA uses iterative design to ensure player/developer synthesis is achieved throughout the development cycle.

The use of an iterative design approach was adopted in the PR:EPARe project due to the proposal from each of the methods. In order to achieve this, the developers used three

development cycles in which user testing and feedback was used to advise improvements and modifications to the product.

3.3.2.3 Needs Analysis

Each of the methods researched, suggested some form of a needs analysis.

- The IM approach has a dedicated section that looks at performing a needs analysis. As an in-depth approach, it targets all areas of considerations including the topic research, stakeholder research and user focus groups to identify needs in the field and how to fulfil them.
- The 4DF proposes that the developer/researcher carries out an extensive review in pedagogic strategies, technological considerations and user design in order to identify the needs of both the student and the facilitator.
- The MDA approach advises that the developers assess the player wants and needs from the offset in order to create a game that appeals and engages its intended audience.

Since one of the IM's core steps in developing an intervention approach focused on conducting a needs analysis, this was adopted into the development process of the project to help identify key information and provide development strategies.

3.3.2.4 User Involvement

Each of the methods proposed the use of user participation to guide development and provide feedback. This method is closely tied in with the other approaches that require user data, such as iterative design, needs analysis, user engagement and user analysis.

- The IM approach identifies the need for user involvement throughout the steps of the framework from the needs analysis to the evaluation design.
- The 4DF examines the benefits of establishing not just student involvement to aid development but also facilitator involvement to help delivery.
- The MDA also identifies the need for player involvement and consideration before the start of any formal game development.

3.3.2.5 Pedagogic Strategy

Both the IM and the 4DF methods are formulas to help guide the development of educational content. In order to achieve successful learning outcomes, the IM and the 4DF propose the use of pedagogic strategies.

- The IM develops the needs analysis data into pedagogic strategies and learning objectives.
- The 4DF highlights the use of learning styles and approaches in order to achieve successful learning outcomes.

The IM and the 4DF both highlight the importance of developing achievable learning objectives and catalogues a series of questions and areas to consider in order to accomplish the set tasks. The use of pedagogic strategies that these methods offered was a core procedure to instilling educational content into the PR:EPARe game.

3.3.2.6 User Engagement Strategy

The IM, 4DF and MDA all use elements of a user engagement strategy due to the involvement of other aspects such as participatory design and in particular the needs analysis approach.

- The IM uses the needs analysis to obtain data which in part focuses on increasing user engagement with the intended final product.
- The 4DF focuses on developing engagement with the student and facilitator by realising that there are other end user groups that just the student.
- The MDA's core principle revolves around developing player engagement by ensuring that designers develop game-play that the target audience wants to experience.

Since user engagement is a necessity in developing a player/game bond it was essential to include these methods into the planning process of PR:EPARe. Using these methods increases the expectation that the intended audience will connect with the final product.

3.3.2.7 Concept Planning & Development Strategy

Each of the three methods advised concept and development planning in the pre-production phase.

- The IM approach has a step that is wholly devoted to concept and development planning. It also draws on data gathered from the other steps to help inform the planning process.
- The 4DF examines a series of principles and directs the researcher/developer to pull them together into a concept for further development.
- The MDA methodology doesn't give a direct suggestion to incorporate concept planning in the design process, however it does offer a guide to developing the main features of a game. This process in itself is a way of concept and development planning.

The use of concept and development planning is a way to save money and time before committing to any physical developments. For this reason, the developers used a concept document to help with the planning process.

3.3.2.8 Resource Development

The IM and the 4DF models both consider resource development as part of their pedagogic considerations strategies.

- The IM considers resource development to play a vital part in providing effective guidance to support an intervention approach.
- The 4DF credits resource development with providing a solution for assistance outside of the game environment such as guidance manuals and additional support materials.

As the developers wanted to ensure that practitioners would be confident delivering the game, a facilitator manual was developed in order to provide guidance.

3.3.2.9 Evaluation Strategy

The IM and the 4DF support the need for developing an evaluation strategy in order to provide an assessment to the efficiency of the game.

- The IM contains a section in its methodology that looks at evaluation development. This is used to cover the design and procedure of developing an effective evaluation strategy.
- The 4DF highlights a similar strategy for the purpose of an effective evaluation design.

Developing an evaluation strategy to effectively assess the final game was a key process in the research project. The IM and the 4DF helped guide the strategies used in the research and planning of an evaluation strategy.

3.3.2.10 Technological Considerations

The IM and the 4DF both consider the use of technology and the effect that it plays on the final product and the user group.

- The IM doesn't consider technology specifically, however it does have a programme plan which develops the project and its process materials and reviews the effect of these methods on the user group.
- The 4DF has a dedicated section that targets the representation of technology when designing a game. Areas such as fidelity, method, use of hardware and software are considered for their effect on the user groups.

In an effort to support the target user groups, technology and its effects were considered when choosing how to develop the game effectively. Areas such as delivery, context and equipment limitations were measured to ensure the developers took accurate measures to improve user engagement and facilitate product delivery.

As shown in this section, the three methods/frameworks all show a variety of methods in common with each other. By synthesising these approaches, the lead designer was able to adopt the methods in the research and development of the game PR:EPARe.

4 Development Approach of PR:EPARe

Following the contextual research found in the literature review, indicates the need for a comprehensive guide that synthesizes health, pedagogy and design considerations in order to create an effective game based intervention approach. In light of this, the core aim of the research is to provide a new methodology for future designs of health based serious games, which consider health, pedagogy, users and design.

Using a combination of the three models presented in this thesis, the Intervention Mapping Approach, The Four dimensional Framework and the Mechanics, Dynamics and Aesthetics Model, the final methodology presented will provide a preliminary example of a comprehensive guide to serious game development in this area, and will provide a novel approach to the implementation of serious games in the educational healthcare sector. Therefore, the first objective of the research will be to reflect and identify the key areas of the chosen methods/frameworks that caused a significant impact in the design and development of PR:EPARe and the second objective will be to present an reflective analysis of these key areas and the case for their consideration in future serious games development strategies.

This chapter outlines the development methods that were taken to produce the serious game PR:EPARe. Since the project was a combined effort between the researcher, SGI and SASH, the development methods outlined in this chapter show the cross over between the groups and the methods adopted by each. It is with this adoption of a participatory approach that the researcher could make informed decisions in the design process and as such many of these decisions are linked to the methods adopted by the other groups. However, distinctions are made in the following sections to show the researchers contribution against those of SASH or the SGI.

4.1 PR:EPARe Pre-Development Consultation, SASH and the Serious Games Institute.

To begin development of a serious game that could address the needs of a sexual health intervention, contextual research was executed and developed by Coventry University's SASH group. SASH conducted a comprehensive literature review that concluded the potential benefits of a serious game targeting the topic of sexual coercion in adolescents, focusing on the need to provide quality relationship and sex education (RSE) in

secondary school education. SASH selected Bartholomew et al. Intervention Mapping approach [1] discussed in Chapter 3, in order to provide the project with a structured development plan and to ensure that the intervention was formed from theory and evidence suitable for its intended audience.

Adopting the IM six step plan [1], SASH outlined five work packages to facilitate the development of the serious game. To address WP3: serious game objectives and concept development [51], SASH and the Serious Games Institute held a concept development meeting to discuss the summary research and data gathered from WP2: needs analysis and steering groups on the matrices of change and the look and feel of the game, see appendices C and E. The work package descriptions, WP1-WP5, can be found in Chapter 3 for further reference.

As an example, the steering committee's feedback gathered by SASH, indicated that the game should contain an element of competition in order to engage the learners. Feedback like this was then examined by the lead designer and was considered for implementation into the game, ensuring that it matched the overall objectives of the intervention.

After initial assessment of both the matrices and the feedback presented from the stakeholder meetings following WP3, Chapter 3, the lead designers design strategy of the serious game PR:EPARe required consideration of integrating both game design and pedagogic content linking together chosen strategies from the framework research conducted in Chapter 3. To address this, two design methods were chosen by the lead designer, to aid in providing informed choices for both of these areas, De Frietas and Jarvis's Four Dimensional Framework (4DF) [62] and Hunicke et al. Mechanics, Dynamics and Aesthetics Model [2].

4.2 Method of Framework Selection

To address the main objective of this research, to develop a new methodology that provides a comprehensive guide to developing serious games in the field of health interventions, a quick scope review of the current available research was conducted by the researcher to find the appropriate methods to aid in the production of the PR:EPARe project, see Chapter 3.

A review of the literature surrounding sex education, serious games and SASH's preliminary work on the project PR:EPARe was undertaken by the researcher in order to assess and present a comparative analysis of state of the art design and development techniques in order to support the production phase of PR:EPARe, see Chapter 2 and 3 for background research. To maintain a high quality review, the researcher looked at key Journals and academic papers concerning digital games and serious game research that were taken from high impact databases. The following databases were searched by the researcher for literature concerning detailed game development guides for entertainment and serious digital games alongside educational theories, ScienceDirect DiGRA, Elsevier, CEJ, ERIC, BERJ, BCERJ, ICTE, and PubMed. Google and Google Scholar were used as search engines for locating serious games and relevant information in the target field due to Google's position as one of the leading search engines currently available.

After conducting a quick scope comparative analysis of the frameworks already available for aiding development in digital games, both serious and entertainment, the researcher identified two frameworks that stood apart from the review, the Four Dimensional Framework (4DF) [62] and the Mechanics, Dynamics and Aesthetics Model (MDA) [2].

The researcher's selection of the 4DF was founded from its reputation as a leading framework for the development and evaluation of serious games in the field. Evidence to support this can be found in Chapter 3. The 4DF presents an iterative approach to serious games considerations, providing a detailed account of requirements needed that include, pedagogy, user design, technology and delivery. Using this approach in the pre-development phase of PR:EPARe ensured that consideration of the end user was undertaken, with focus drawn to not only the student but the practitioner that would lead the delivery of the final product. Imbedding core educational content was also a priority using this approach. To address this, SASH developed the appropriate educational content, and this was imbedded by the lead designer in to the game, using a range of game mechanics to support the subject delivery. By adopting a 4DF approach, the conditions of effective serious game development were clear, and were used to aid development of a focused methodology for health based serious game development.

The researcher's selection of the MDA model was chosen for its design and development techniques associated with entertainment digital games. The authors of the model have produced several high end AAA titles such as *Flower* and *Journey* and as such, have developed a reputation as leaders in the games design field. Additional supporting evidence for the MDA model can be found in Chapter 3. Applying the MDA to the production methods of PR:EPARe required an understanding of the user's relationship within the game environment that was being created. Focusing on developing core dynamic experiences from the mechanics in order to enhance the overall game play was one of the key conditions of applying the MDA to PR:EPARe. Concentrating on the user experience, and drawing the focus of developing the essence of the game without its educational and behavioural change objectives yet imbedded, provided the opportunity to secure the 'fun' element of the game. This model provided the fundamental guide to digital game design and development, and was used in the research to provide an aid in the field. The figure below shows the visual development of the 'fun' aspect that I created in an effort to enhance the user's experience.

Figure 21 Screenshot of PR:EPARe indicating visual aesthetics.

4.3 Method of Game Development

As the lead designer in the PR:EPARe project, the role required a high state of interaction and feedback between each of the project's development units. These teams included clinical psychologists, researchers, focus groups, game developers, game programmers, sexual health practitioners and end users. With a focus on participatory design taken from the research of the three models, the IM, 4DF and MDA approach found in Chapter 3, gathering feedback and relaying this to the appropriate groups and inserting the correct information into the project's design, required strong communication between the groups. This also required the project to be flexible as feedback and testing were gathered over the different units often. Addressing the frameworks for aid, each suggested an iterative approach to games development. This was the method that was adopted by the lead designer, using the flexibility of iterative design to incorporate participatory design and feedback without delaying the project. A

strong emphasis was therefore placed on discussion and feedback, two areas that were considered a high priority in each of the chosen frameworks, Chapter 3.

The key development processes that were gathered and used by the lead designer in the development phase of PR:EPARe that were guided from the pre-production analysis were;

- The Iterative Approach
- The Participatory Design Approach
- Practitioner based User Design
- Needs informed Design

With each of the frameworks pointed to developing a game using a participatory approach, see Chapter 3 for the framework relationship. SASH used six stakeholder groups, Applied Research Centre in Health & Lifestyle Interventions, NHS Coventry Public health, NHS Warwickshire Public health, Coventry City Council, Warwickshire County Council and the Serious Games Institute. These stakeholders were used to gather data and thus guide the development of the PR:EPARe game, sharing information and providing instruction for the initial concept meeting and providing feedback throughout the project. These groups were also used to gather potential young person groups that could be used in the evaluation phase.

The needs analysis that was carried out by SASH, see Chapter 3, was an integral part to informing the lead designer as to the design decisions that needed to be made for the game to achieve its outcomes. SASH, used the feedback from the needs analysis to draw up a list of learning objectives that were to be incorporated in to the game. These were then matched up by the lead designer to a number of game aesthetics and mechanics that would provide a base for these objectives to be realised.

As an example of one of the lead designer's decisions, one of the change objectives was to identify the nature and levels of sexual coercion and was broken down into three parts, discussion, participation and advance organisers. The mechanics chosen for these objectives allowed the learner to interact with different scenarios after being informed about the situation, and were encouraged to further discuss their feelings about coercion. Figures 22 and 23 below show some of the examples of the scenes used to depict a

possible coercive scenario. The pause button in the corner of the screen allows the facilitator to pause the game in order to discuss the topic.

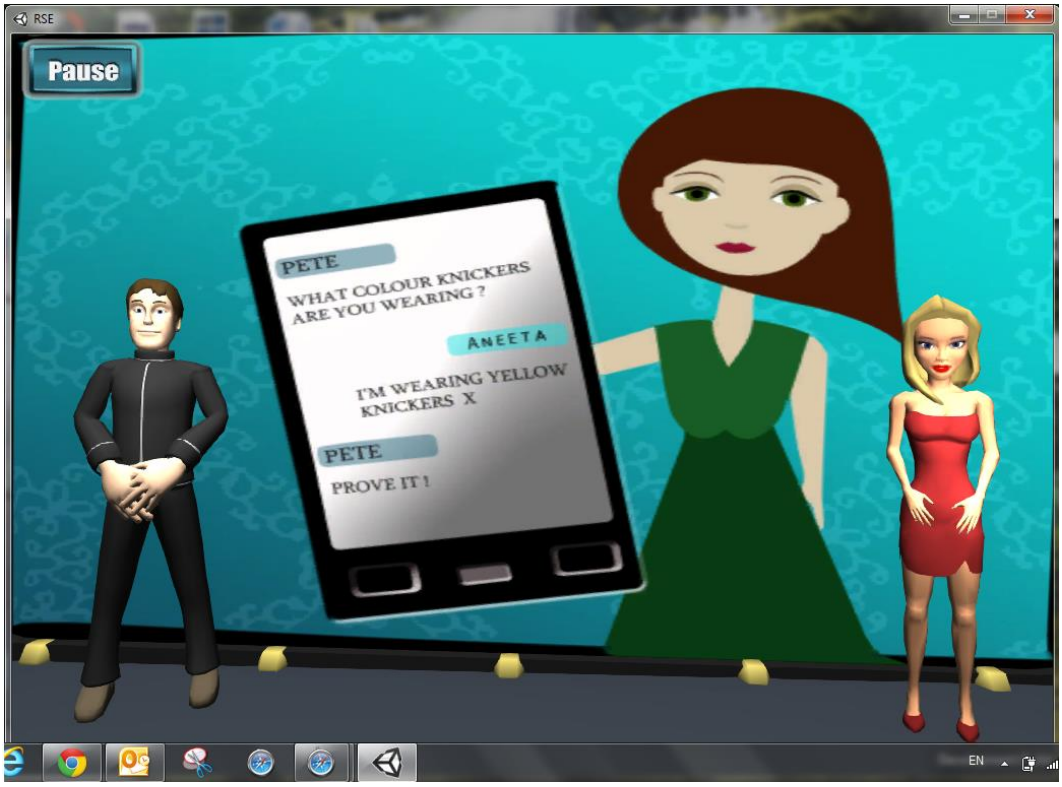


Figure 22 Screenshot of PR:EPARe Scenario

Figure 23 Screenshot of PR:EPARe Role-play Scenario

The needs analysis carried out by SASH that was taken from the Intervention Mapping approach, provided a sound base for the lead designer's development decisions, in order to maintain focus and ensure that project aims were met.

Addressing the MDA and 4DF models, found in Chapter 3, the lead designers focus was drawn onto the user experience with a strong emphasis on developing user response and creating enjoyment from the challenges within the game. To help users respond to the initial concept of the game, the lead designer took a look at popular culture and existing games and identified a popular trend in game shows such as *X Factor* and PS3 family games such as *Buzz*. The theme of a game show environment and associated game mechanics was therefore chosen by the lead designer to reflect this information, and to promote maximum engagement and encourage the 'flow' state in the interventions target group. The figures shown below display the 'host' characters and the game show environment that was used to enforce the chosen theme through the visual aesthetics.

Figure 24 Screenshot of PR:EPARe Host Characters

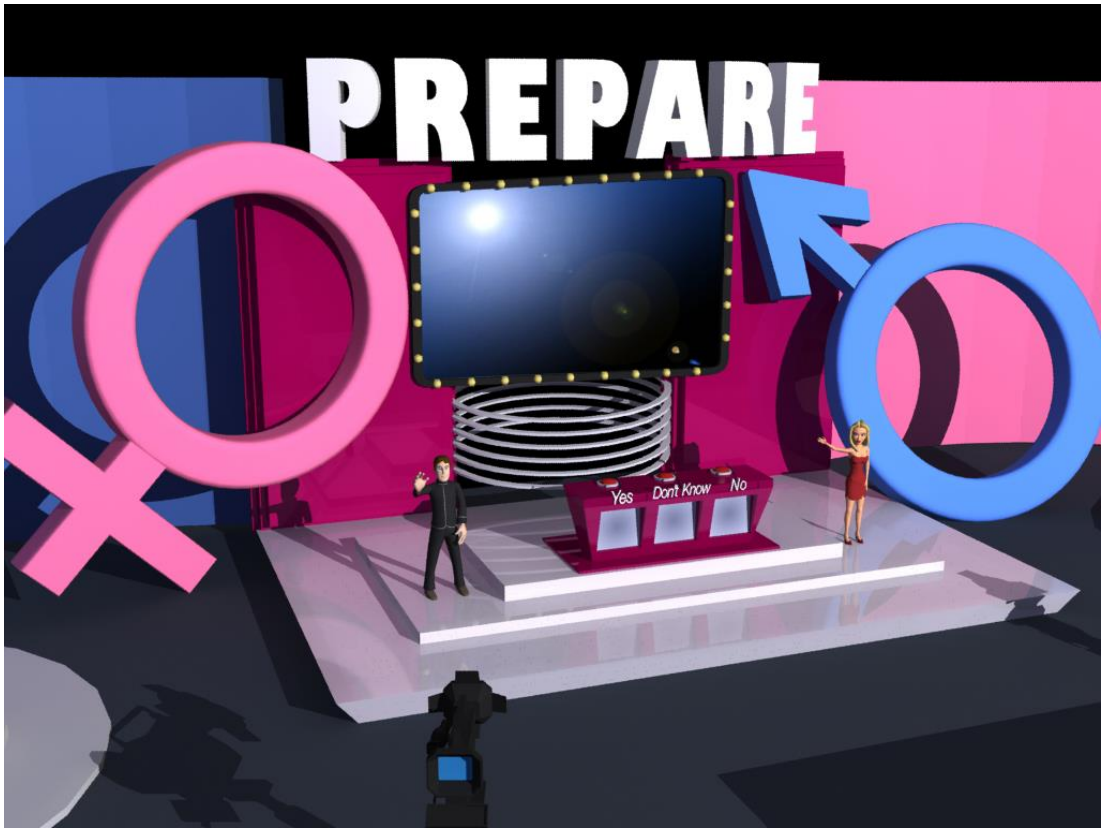


Figure 25 Screenshot of PR:EPARe Game Show Environment

The game was developed in two sections following feedback from the stakeholder meetings, this was a decision put forth by the lead designer to SASH. The first part would form a facilitator led, discussion based scenario and the second would allow the users to role-play examples of coercive situations, and make choices to see the eventual outcomes. Figure 23 shows an example of one of the role-playing scenario's that were adopted into PR:EPARe that was developed from WP2 & WP3, see Chapter 3. Two host characters were developed to deliver the script containing the relative sexual health material and to provide guidance throughout the game, this guidance was provided by SASH.

Game mechanics were developed by the lead designer to aid this process and help facilitators in the delivery process. SASH produced a method selection from WP2, see Chapter 3, to help identify target change objectives and the applications that were to be put in place to address them, see Appendix F for the full table of methods. See below for a diagram showing the key parameters used for the methods evaluation table.

Figure 26 Key Parameters for Method Evaluation

Breaking down the objectives provided the lead designer with clear aims that was needed to address within the game. This allowed the lead design to ascertain and match the needed mechanics to objectives in order to create the games dynamic atmosphere for the user, as outlined in the MDA model, see Chapter 3.

The full table outlines three of the key methods that were considered for the production of the PR:EPARe game that were laid out by SASH, discussion, participation and feedback. Consulting the chosen frameworks in Chapter 3, the lead designer identified that these areas were essential for developing an efficient and engaging game. Even the MDA that targets entertainment games suggests that the design should reflect the participation of the player foremost and work from player feedback through the dynamics to determine the overall mechanical structure of the game. In order to achieve the specified change objectives it was important for the players to be presented to these methods, to allow for critical reflection and self-learning.

Taking into account the user aspect that the frameworks point to for consideration, the lead designer also looked at the facilitator as the end user alongside the students. To aid the facilitator in the delivery of PR:EPARe, it was essential that game mechanics were implemented to ensure that the facilitator would feel comfortable using the game. These included a timer, a pause and fast forward option and the ability to easily select the required scenarios.

SASH prepared a facilitator manual, that provided instructions and guidance for applying PR:EPARe in to a lesson plan, and how to facilitate student discussion. Shown below in figure 27 and 28 are examples of the timer and the different scenarios that

facilitators could use/choose from to aid in the delivery of the game, that were implemented by the lead designer.

Figure 27 Screenshot of PR:EPARe Timer

Figure 28 Example of PR:EPARe Scenario Choices

To follow up the end of the game, facilitators are advised to provide relevant information and help on the topics found throughout PR:EPARe, and are encouraged to use existing school resources as a follow up to aid students concerned with coercion and relationship guidance.

By designing and developing PR:EPARe through the aid of the analysed methods, the finalised product is used as a case study to aid in the development of a new design framework, incorporating the key processes that were highlighted in the evaluation results to be beneficial in the games development.

4.4 Evaluation

My role throughout this stage was to gather feedback and filter it into the PR:EPARe game, looking at how we could promote and further acceptance of the application for the practitioners and students.

To address the aim of this research a post-production reflective analysis of the quantitative and qualitative data gathered from SASH's evaluation was undertaken. By using the outcomes gathered from both studies, it was then possible to evaluate the design and development decisions that were chosen throughout the making of PR:EPARe. The data and feedback gathered show change in some factors and provide the varying opinions that were received from using a game based intervention in the style of PR:EPARe. Further information on the evaluation can be found in chapter 5 and 6.

Alongside my experience and participation as the lead designer in the project, my reflection of the analysed data has allowed me to present a preliminary evaluation of the PR:EPARe's game design and production decisions, and to support my overall aim to develop a new methodology for future work in this area.

4.5 Framework Analysis

The development decisions that were taken for the development of PR:EPARe were based from the methods/frameworks, the 4DF, Intervention Mapping and the MDA, were used throughout the PR:EPARe project. These were analysed to produce a run-down of the perceived useful components of each framework, and develop this into a focused methodology to target future health based serious games.

4.5.1 Engagement and Acceptance

It was important for the developers to address one of the main problems that most serious games face in the deployment phase, user acceptance and engagement. Each of the frameworks was consulted to address this issue, with similarities being found across all three.

4.5.2 Needs Analysis and MDA Aesthetics Table

Each method/framework suggested that to promote engagement in users, a look into the user specification and user experience was required. Both the IM and 4DF methods/frameworks have sections entirely devoted to development in user studies, with the IM approach supporting a needs analysis section and the 4DF supporting a learner specification approach. These approaches show commonalities in attempting to support the user by providing a tailored guide for the e-learning experience. By adopting these approaches, information can be gathered on the profile of the target user group such as age, gender, competencies and behavioural factors, which are used to aid in the development of the game. Obtaining this information early can lead to informed choices in the game and usability design, and furthermore allowing the developers to consider the needs of the target users.

SASH conducted a needs analysis from the IM approach to gather data on the user group. Using steering groups to gather evidence to support the chosen subject and group choices, evidence was also gathered to show what the users wanted from a serious game. This evidence can be found in full in Appendices B and C. Focusing on this evidence provided from the steering groups, comparisons were drawn through reoccurring themes set out by the development team. One such theme from the feedback showed that users wanted an element of competition to the game. Another strong theme to arise was that users mentioned *'The Sims'* game, with the mechanic of playing out a character life, and experiencing different roles. See figure 27 for an example of the competitive element that was instilled into part one for PR:EPARe.

Using this feedback, the MDA model was consulted to line up player experiences or 'aesthetics' to ensure that the game provided the feeling of a player led experience which would promote acceptance and engagement. Examining the aesthetics table, four

main representations were chosen to model the games experiences around based upon the feedback gathered from the needs analysis.

- Challenge – Game as obstacle course
- Discovery – Game as uncharted territory
- Fantasy – Game as make believe
- Expression – Game as self-discovery

These experiences were drawn into the games design in order to create an engaging user experience, with section one of the game highlighting challenge and discovery and section two emphasising the fantasy and expression experiences.

4.5.3 User Analysis and End User Mechanics

To follow on the importance of learner/user profiling for game acceptance and engagement, the lead designer took a closer look at the end user from the needs analysis report. Whilst the feedback showed the importance of developing student interest, another end user surfaced within the feedback, the educationalist.

The deployment and delivery of an effective serious game required that the practitioner leading the lesson perceive that the game was altogether useful and uncomplicated to use in a classroom environment. In order to achieve this, the lead designer had to plan two end user experiences that included both student and practitioner led design.

Using the steering group's feedback from the needs analysis found in Appendices B and C, SASH focused on the recommendations that the games content should coincide and complement the existing RSE curriculum. It was also raised that a focus be drawn on relationship building education, sexual and non-sexual, and was highlighted as a gap in the current curriculum. Using this approach, SASH was able to determine what the practitioners would perceive as useful in their RSE lesson development. This was then fed into the overall programme goal and concept development of PR:EPARe by the lead designer.

To develop PR:EPARe from a practitioner led user view, the lead designer took a look at the 4DF and the IM frameworks which showed evidence to support that context and practical strategy assessment and would provide the aid needed in this area. Via

feedback conducted as to the educational circumstances such as game content, environment, class structure, resources, support and technology, it was clear that the practitioner needed to feel in control and comfortable using the game in class. To achieve this, a combination of methods was used by the lead designer in view of practitioner user design, game dynamics and mechanics, game technology and the supporting practitioner handbook.

Since the aesthetics of the game had been chosen by the lead designer to foster student user acceptance, the dynamics of the game were determined from the MDA approach to provide the run time behaviour of the player inputs. This was used as a basis for instilling practitioner based design into the game, insuring that the practitioner had complete control of the games behavioural aspects through the student's input. Game mechanics were then chosen by the lead designer, to support practitioner control and review. Further information can be found in the Chapter/Section: 6.1.5 Complexity Appreciation Feedback.

The 4DF draws a direct emphasis on the importance of the technology used when developing a serious game. This was taken into account by the lead designer when considering practitioner acceptance and led to the game's technical specifications being able to run alongside existing school acquired technology such as Smart Boards, PCs and Macs. To foster acceptance, the lead designer linked current school technology to PR:EPARe in an attempt to promote ease of use.

A facilitator's manual was created by SASH to aid the practitioner in the delivery of PR:EPARe and can be found in Appendix I. The 4DF model asserts that it is necessary to provide adequate resources to aid a serious game. This is further backed up in step 5 of the IM approach, the adoption and implementation plan, that supporting resources and strategies are incorporated to aid behaviour change. Whilst the behaviour change at this point is not of the students, it is important that the facilitator feel comfortable and supported, even if adverse to technological applications. Further results of the facilitator's manual can be found in the section dedicated to the consistency of delivery section.

Each of the frameworks/methods state, that a serious games design and development cycle should embrace an iterative practise which allows for a participatory planning and design approach. This method allows the developer to work alongside subject experts, researchers, stakeholders and end users to obtain the desired result. It also allows user feedback and testing to be incorporated back into the development cycle to produce the required finished product. As a result from consulting the frameworks, this development method was adopted in the research and development of PR:EPARe by the lead designer, SASH and the SGI, and relied on both an iterative cycle and a participatory design approach to achieve its objectives.

4.5.4 End User Involvement

One of the core requirements that was brought to light from the needs analysis was that PR:EPARe was to include both an individual and group style of play to fit into the classroom environment. To address this, the developers incorporated game mechanics that were chosen to aid and encourage the users to interact with the game environment. Building on the development of the MDAs aesthetic selections chosen for PR:EPARe, mechanics were chosen to compliment both styles of play. For example; the aesthetic choice to include a competitive element in the game play relied on the desire of the players to interact with the game. A reward structure was therefore set in place to offer both positive and negative reinforcement for answers given by the players. The reward structure set out as a mechanic inspired from the MDA research, allows for a dynamic behaviour to occur between the players. By encouraging player consequence through the competitive element, players have a vested interest in how they interact with the game play. This tactic was used by the lead designer to encourage interest in both group and individual play.

The requirement to have an open and informative facilitator led discussion was put forth in the needs analysis by SASH, to ensure an effective intervention was produced. To encourage student behaviour to engage in group discussion, game mechanics were added by the lead designer to help the facilitator control and lead the game play. This approach allowed the facilitator to inspire the students to participate in the games suggested discussions whilst remaining in control of the lesson. The mechanics that were chosen to aid the facilitators were as follows;

- Section choices – The facilitator could choose to play through part one which focused on a question and answer style or part two that focussed on role play.
- Scenario choices – This allowed facilitators to choose the appropriate scenario to play out. This was added so that the game had greater scope and control with different year groups with appropriate game material.
- Pause/Skip functions – These functions similar to a dvd menu provided the facilitator with the ability to either pause the whole game to participate in discussions or to skip back to areas of the game that may have been played too fast or further information was needed.
- Timer – A timer was added to section one to help facilitators control the amount of time spent on each question. This mechanic was installed to allow facilitators to lesson plan and to encourage students not to waste time.

These mechanics act as supporting resources within the game that were inspired from the 4DF approach. Including these methods of support for the facilitator increases end usability and stimulates the aesthetic experiences for the player.

4.5.5 Pedagogic Strategies and Educational Game Content

In order to provide an effective e-learning intervention, considerations for how to embed the learning content into PR:EPARe without deterring student engagement were a top priority for the entire team. SASH had developed a set of change objectives from the IM needs analysis. From this, SASH then referred to the strategies set out in the IM program objectives section for approaching change in the determinant types. The determinants that SASH chose to address were;

- Knowledge
- Attitude
- Optimistic Bias
- Self-efficacy
- Subjective Norm

The logic model that aided in this development can be found in Appendix D. This strategy was adopted for inserting the change objectives and pedagogic aims set out in

the programmes overall goals to fit within the games content and provide an effective intervention.

SASH chose methods that involved the participants to display a higher level of interaction with the game. Participation, discussion, belief selection, guided practice and feedback featured highly in the method selection amongst others, which was carried out by SASH to promote active learning with the students. The method selection can be found in Appendix F.

Referring to the 4DF model's section on pedagogy, similarities were drawn between the methods found and the suggestions to implement an active learning experience in order to achieve the learning outcomes by the lead designer. The 4DF presents a view that to achieve the learning objectives a serious game should look to apply social/situated, associative and cognitive learning strategies. In essence the game should look to apply cognitive thinking, observation, discussion and role play scenarios to achieve an effective application. The information provided from both of these models led the lead designer to decide that the methods outlined by SASH such as discussion and participation would provide the base for developing the games mechanical content.

SASH presented at the first development meeting a preliminary concept document that provided a run-down of the learning content that was to be used in PR:EPARe. The concept document can be found in Appendix A. Using the reference material, the MDA was consulted to provide suitable aesthetic experiences that would complement the methods set out by SASH. As previously mentioned in the section needs analysis and MDA aesthetics table, the experiences chosen were;

- Challenge – Game as obstacle course
- Discovery – Game as uncharted territory
- Fantasy – Game as make believe
- Expression – Game as self-discovery

Within these four expressions mechanics were implemented into PR:EPARe by the lead designer that complemented the style and educational methods set out by SASH. For example, choosing to develop the game on a fantasy and expression design allowed the lead designer to incorporate learning methods such as role-play and behaviour

modelling into the mechanics design. As discussed previously, the mechanics that were incorporated for the benefit of practitioner delivery such as the pause and skip functions of the game, also were a part of this process for instilling SASH's methods into PR:EPARe. These functions allowed for a discourse to take place between the facilitator and the students and encouraged student participation in the game content and environment.

As highlighted in both the method selection carried out by SASH and the 4DF, feedback was a vital part to forming an effective learning experience. To address this, the lead designer chose to use 3D host characters as the subject's material source. The hosts were used to provide information and context before and during a scenario created by SASH, and then used to provide feedback once an answer was submitted or a scene played through. This created a responsive learning experience that constantly fed back to the learner allowing for self-reflection and conscious response to the subject material.

By using the IM and 4DF models in the pre-development phase of PR:EPARe, pedagogic considerations and change objectives led to a method selection process. This method, founded informed choices that led to the development of the games overall theme, aesthetic experience and mechanical structure. The end result presents an intervention approach which is educational as well as engaging for both student and practitioner.

The methods presented in this chapter show the lead designers, SASH and the SGI's considerations of the selected methods/frameworks and the methods guidance used in the development of PR:EPARe. The evaluation and analysis of these methods can be found in Chapter 6.

5 Methodology

A reflective analysis was conducted by the researcher on the data that was gathered by SASH's evaluation, in order to consider the key techniques and produce the DeLHTA methodology. As such, this section outlines the SASH evaluation strategy and its methods alongside that of the researcher's procedure of analysing the data.

5.1 Research Design

The purpose of the research set out in this thesis was to address the need to create a new development methodology that would combine serious games, entertainment games and intervention techniques into one approach. The researcher conducted a comparative analysis from a literature review into serious games development and found a gap in the research for developing focused methods to aid serious games design and development. The researcher found that there was no specific method or framework that helped aid the development of health based serious games and very little examples of multi-disciplinary targeted aids in serious game design.

Whilst this was the case, the researcher identified two methods, the 4DF that targeted serious games design and the MDA that targeted entertainment games design, to aid the production of an health intervention game-based approach titled PR:EPARe. A third method that was highlighted in the research conducted by SASH was used as an aid in addressing the field of health intervention design. These three methods were used by the researcher as a basis for developing the game PR:EPARe, with techniques adopted from each method into the design and development process. These techniques would then be used to form a new combined methodology after the analysis of the PR:EPARe game had taken place. Any techniques discovered from the evaluation data of the game would be used as the first step to developing a pilot methodology that would bring together these three fields in the hope of producing better design and development practises.

In order to evaluate the techniques that were adopted in the development process of PR:EPARe, data would need to be captured that showed the efficiency of the game and any of the techniques used. Due to the time constraints of the research project, the researcher adopted a reflective analysis and synthesis approach to determine any key

findings. The data that was analysed by the researcher was taken from SASH's evaluation report that was conducted to test the efficiency of the game PR:EPARe. In the evaluation report both qualitative and quantitative data was collected by SASH (explained further in section 5.2) and was then analysed by the researcher to record and synthesise any significant findings that would aid the development of a new methodology.

Adopting reflective analysis as a method of evaluation, allowed the researcher to develop further hypothesis as to how a new methodology should appear and what it should contain, by reflecting on the data that was captured by SASH.

"Reflective analysis" is another name for phenomenology, a school of thought that begun in 1900by Edmund Husserl (1859-1938)[74]. The method of reflective analysis is a process often used in developing theories and conclusions in educational practise [75] and is believed to be a technique that helps individuals and/or groups reflect on their experiences or actions in order to engage in a process of continuous learning. Reflective analysis also enables the recognition of paradigms, assumptions, frameworks and patterns of thought and behaviour – that shape thinking and action and furthermore, allows for the exploration of broader questions.

The use of reflective analysis has been shown to guide evaluation in a number of areas of research. This was also the case in serious games research and has been found by the researcher to have been used in a number of areas in this field such as simulation experience design [76] or used for addressing serious game characteristics [77]. It is from this evidence that the researcher adopted this method in analysing the data that was gathered from the SASH evaluation. Using this approach, the researcher reflected on the process adopted to identify any patterns or correlations between the data gathered by SASH and the development techniques from the three methods/frameworks that were implemented in the development phase of the game PR:EPARe.

To aid this process, the researcher used Kolb's (1984) experiential learning cycle [78] as a guide to organising each aspect of the research, after links between reflective analysis and Kolb's learning cycle were shown to assist in this process [78].

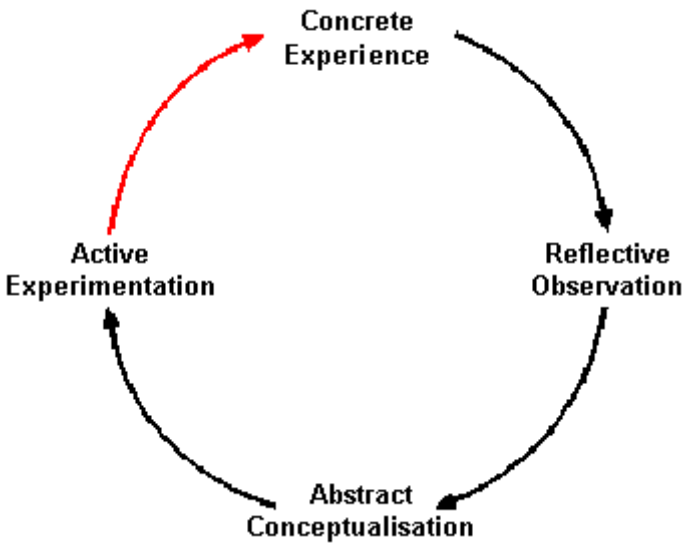


Figure 29 Kolb's Experiential Learning Cycle

The research conducted in this thesis, maps to the first three areas of Kolb's learning cycle; Concrete Experience, Reflective Observation and Abstract Conceptualisation. Each area is represented as follows;

- Concrete Experience is represented in this research by the design and development process of the game PR:EPARe.
- Reflective Observation is represented by the analysis of the evaluation data.
- Abstract Conceptualisation is represented by the DeLHTA method that was produced from the reflective analysis.

Since this is a preliminary study, the final section of the learning cycle, Active Experimentation will be put forth as future work, ensuring that the next stage of developing the DeLHTA method will be to evaluate it accurately.

5.2 Evaluation Strategy

This section documents the design and procedure of the SASH evaluation strategy. The data gathered from this evaluation was used as the basis of the reflective analysis conducted by the researcher.

5.2.1 Design

The evaluation developed and conducted by SASH involved a small-scale cluster randomised controlled trial (RCT) of part 1 of the PREPARE game delivered in RSE sessions in schools (study 1), and a pre-post evaluation of the whole game (parts 1 and 2). Standard RSE delivery was used as the control for the Cluster RCT. A 2(time: baseline vs. follow-up) x 2(condition: Intervention vs. control) mixed design was used to assess changes in measures recorded over time and between groups for study 1. A pre-post repeated measures design was used for study 2.

Additionally, field reports and feedback following sit in sessions of the trial were gathered to collect qualitative data. Feedback from students and teachers was also sought on their experience of playing the game in class at the end of the teaching sessions. Their responses were recorded.

In this process, it was my responsibility to assess the initial qualitative feedback gathered by SASH in the beta stages of evaluation, and use it to inform the iterative development process. This meant using the feedback to change areas of the game that were unappealing to the users after play through.

5.2.2 Participants

Data, both quantitative and qualitative, was gathered by SASH to determine the efficiency of the game PR:EPARe. The following participants were used to gather this data.

For study 1, all schools across Coventry and Warwickshire were invited to participate in the evaluation study. Three schools representing a range of socio-demographic backgrounds and with pupils from non-white as well as white ethnic backgrounds responded positively to invites and provided a total of 17 Year 9 classes to take part in the trial. In total, 505 participants (males = 253; females = 247; no information re: gender = 5) were gathered. All participants were in school year 9 and aged either 13 or 14 years (one participant reported being 15 years) with a mean age of 13.5 years (Standard deviation = 0.5 years). Data re: age was not provided by 9 participants. Of the

17 classes, 8 were randomized to the control group resulting in N = 207. Nine classes were randomized to the intervention group resulting N = 298.

For study 2, four schools volunteered a total of 9 Year 9 classes to take part in the study. There were a total of 257 participants (males = 113; females = 140; no information re: gender =4). They were aged 12-15 years with a mean age of 13.88 years (standard deviation = 0.56 years). All participants played the PR:EPARe game.

5.2.3 Measures

Self-report questionnaire measures based on performance objectives were devised and can be found in Chapter 6, Section 6.2. All questionnaire items were scored from 1 (strongly agree) to 5 (strongly disagree) when the data were input into statistical analysis software. Thus, a lower score on each item represents a lower risk of being coerced or putting pressure on someone else to do something they are unhappy with and greater psychological preparedness for responding appropriately to potentially coercive situations.

Qualitative data was gathered from students and teachers who supplied feedback via face to face interviews. Sit in sessions of the trial carried out by SASH researchers also took place and from this, observational data was recorded. Further information on the measures taken can be found in chapter 6.

The qualitative data was the most relevant data to the researcher to aid the process of developing a new method. Analysis of the qualitative feedback from the students and teachers allowed the researcher to reflect on aspects such as engagement, acceptance and usability of the game. Furthermore, this type of data highlighted any corresponding themes from the user's feedback to the methods that were adopted. For example, teachers gave feedback that indicated the facilitator's manual aided their lesson plan. This indicates that the incorporation of this method taken from the IM approach could have aided acceptance and usability in practitioner users.

The quantitative data was the secondary data that the researcher analysed and was used as a guide to what areas of the game showed a positive effect. Using this data to show the efficiency of parts of the game, helped the researcher to reflect on the methods used

to achieve the change objectives. From the data, it was easier to see if a method had aided in achieving the change objectives or if a different method/approach should be adopted in its place. From the quantitative data, future iterations of the PR:EPARe game can be developed by addressing the areas that produced same or negative results.

5.3 Procedure

After ethical approval was sought through the Faculty of Health & Life Sciences at Coventry University, data collection began. The schools that had agreed to participate in an evaluation study were provided with research information and letters to send to parents of those being invited to take part. Opportunity was then given to the parents for children to withdraw from the study if they did not wish to participate. Participant Information Sheets were also given out to all students. Once participants were informed and consent was received the studies took place.

In study 1, initial baseline data had been collected and from this the students of each participating class were randomly allocated to either the control (standard RSE lesson) or intervention condition (Serious Game based lesson) using a computerized dice. In the week following the delivery of the RSE session participants were asked to complete questionnaire measures again.

In study 2, all classes participated in the Serious Game lesson. The cluster RCT procedure applied in study 1 couldn't be undertaken due to the ending of the school year. However, further studies are predicted to address the lack of data gathered from study 2.

Qualitative data was gathered from both studies using student and teacher feedback.

After the data had been gathered by SASH using a cluster randomised trial and had been refined to produce final figures and information, SASH made a report containing the findings.

The researcher used this report to reflect and synthesise the qualitative and quantitative data that was gathered by SASH. The reflective analysis of these findings can be found in chapter 6. Once the researcher had analysed the data and had recorded the significant

findings, synthesis between methods used in the development of PR:EPARe and the evaluation data were conducted in order to produce a new preliminary method titled DeLHTA. Further information on the DeLHTA methodology and its justification can be found in chapter 7.

6 PR:EPARe Evaluation and Analysis

The research presented in this chapter presents an overview of the evaluation of the game PR:EPARe. The data analysis gathered from the evaluation and report carried out by SASH is subject to a reflective analysis and synthesis is drawn against the techniques that the lead designer integrated into the serious game PR:EPARe.

To address the aim of this research, a post-development analysis of the quantitative and qualitative data gathered by SASH was undertaken to provide a reflective account of the correlation between the project's findings and the framework led decisions. The data for this section is taken from the final report conducted by Brown et al. [7]. In this post-analysis, a comparison is drawn from the observations and feedback gathered in each area from the report and mapped against the development decisions. The decisions were taken from a pre-production framework analysis and were applied to the development phase in an effort to create an effective game-based intervention approach to RSE. The results are documented to provide a clear relationship between framework, decision and effect.

The data, both quantitative and qualitative presented in this chapter was gathered by the SASH research team was carried out on a number of student participants across Warwickshire and Coventry schools which equalled to 505 participants (males = 253; females = 247for study 1 and 257 participants (males = 113; females = 140 for study 2, ages 12-15. The evaluation was carried out using a small-scale cluster randomised controlled trial (RCT) and data was gathered using self-report questionnaires. More information on this can be found in chapter 5, section 5.2 of this chapter.

6.1 Qualitative Data Analysis

Members of the SASH research team were present for the delivery of eleven of the game delivery sessions in order to observe the lesson taking place. Notes were made about any issues that arose and feedback from student and teachers' responses whilst playing the game was recorded. Feedback was sought verbally after several of the sessions, which documents students and practitioner's opinions and considerations of the game.

The SASH research team also went back to the various young people's steering groups who had been involved in the development of the game concept and asked them to play with the game informally and give feedback on what they liked and wanted changing. Feedback was positive, but the participants were keen that small improvements to some visual aspects were incorporated into the final game build.

All of the feedback was considered and wherever possible, incorporated into the final development build of the game. Reflective analysis of the feedback has resulted in the emergence of a series of themes relating to this data and they are presented below.

Taken from the report, the quantitative feedback that was gathered is broken down into six areas;

- Consistency of delivery
- Complexity appreciation
- Contributions and Inhibition
- Novelty
- Engagement
- Acceptability

The feedback was gathered from both students and facilitators, to provide a comprehensive overview of both target user groups. This allowed the lead designer to understand the game's impact on both target user groups and was used as an alpha test to draw out any technical faults, visual amendments and to implement user suggestions. As lead designer, I was responsible for overseeing this process, evaluating the feedback and implementing the needed modifications to the game.

6.1.1 Needs Analysis and MDA Aesthetics Table Feedback

The qualitative feedback gathered from the Brown et al. [7] report indicates that the observed lessons in which PR:EPARe was deployed showed a high level of engagement from the students. This was confirmed by the facilitators who stated students had engaged with the game and the related discussion groups and shown a high level of enthusiasm.

The observational feedback indicated that students responded positively to the competitive element of the game, cheering when they got answers correct and showing disappointment with wrong answers [7]. Students showed an interest in their answers which allowed for effective discussions to be held on the subject of coercion. The feedback indicated that from an observational point of view the competitive element of the game inspired engagement within the students and thus encouraging thought and attention to the subject of coercion.

The report shows positive feedback to support the development method adopted. By mapping the needs analysis feedback from the IM approach to the MDA aesthetics table, the developers were able to choose relevant player experiences for the users. By accessing what the users wanted and expected from the game, the development team were able to pinpoint what would make for an engaging experience for the target user group.

Reflecting on this, the use of a needs analysis helped guide my designs by highlighting core information about the target user groups. Using this information, it was easier for me as the designer to map this against the MDA aesthetics table in order to produce mechanics that I thought would work well with the user group. Having all of the information before any development or planning work started really allowed me to feel confident in how I was addressing the overall objectives of the project and as such would be a tactic that I would adopt again for future works.

6.1.2 User Analysis and End User Mechanics Feedback

The qualitative feedback received shows that positive reactions were expressed in each class except for one as to the appropriateness of the game for the age group. Ultimately the feedback advised on the facilitator's discretion for the use of the game with different year groups; however the positive results are an indication that the user analysis and learner profiling were essential in identifying and matching game experiences from the MDA to the suitable user age group.

The report shows that facilitators in particular were keen to express that the resource's topic of sexual coercion and pressure was an area that students had shown previous interest in. As a result the game had provided a beneficial application to help guide

discourse and develop skills in the subject area. SASH reports that the use of a needs analysis and stakeholder meetings in order to identify an required area for the game-based intervention has produced positive results with the facilitators and as a result has elevated PR:EPARe's perceived usefulness.

Whilst there is no definitive feedback to support the context of technology and facilitator ease of use in the Brown et al. report [7], the response to the game in itself shows promise in this area. As the overall response amongst the facilitators proved encouraging, we can presuppose that the simplicity of the technology chosen for the games development enhanced facilitator acceptance. This area needs further consideration and facilitator testing in order to provide substantial evidence to support these claims.

The results also show an encouraging position for the use of participatory games planning and design. By including stakeholders and young people from the offset of the games development, the developers and researchers were able to tailor the game to the needs and wants of the target user groups, striving to see that the programme goals were met. By using the participatory feedback that was gathered throughout the three stages of the games cycle, pre-production, production and post-production, the focus of the game was never far away from the original objective as user feedback was constantly reviewed.

The focus of the user's feedback ensured that the games cycle was an iterative process. This allowed for any game visuals, audio or mechanic alterations to be made so that the users found the overall game appealing. The report shows that overall the students and the facilitators found the context and the aesthetic style of PR:EPARe to be enjoyable and acceptable, emphasising the importance of adopting an iterative and participatory development cycle to ensure user satisfaction.

Overall the qualitative feedback in this section shows a level of optimistic acceptability and engagement from both student and facilitator users. The development methods adopted from the frameworks to help promote engagement and acceptability, in particular the needs analysis, MDA aesthetics, context assessment, participatory design and the iterative cycle have shown significant results to support their use in future

development projects. Further evidence needs to be supplied for the context section (4DF) for the support of technological considerations; however the games acceptability amongst the facilitators with all involved stating that they would use PR:EPARe again [7] shows a probable case for the use of context support.

Reflecting on this, the use of an iterative development cycle was considered an important and informative process in which I learnt alot. With games design and development, it is never easy to design a game that is going to be well received by everybody and serious games are equally difficult it not more so in this area. Using feedback from the students and teachers allowed me to update parts of the game to reflect any real issues that the users had with it. As such this process was viewed as an essential part to the process of developing PR:EPARe.

Adopting a game to suit two user groups with different needs was one of the most frustrating parts of developing the game. Using participatory design went some way to help ease this. However, in future work I would like to see more targeted feedback sessions with educationalists that focused on gathering feedback on areas such as delivery and ease of use. I would adopt participatory design as a standard procedure in creating any serious game.

6.1.3 Novelty Evaluative Feedback

Feeding into the technological context of PR:EPARe, SASH reported that the positive engagement that occurred with the use of PR:EPARe could have stemmed from the novelty of using technology in this type of lesson. This was commented on by both students and facilitators with an emphasis that it provided an interesting learning experience. This feedback supports the above research for the use of technological context. Although the feedback suggests in support of the use of technology rather than the ease of use in technology, the results are still positive concerning context for future works.

Leading from the novelty of the technology, feedback was raised concerning the use of group based computer interaction vs. individual computer interaction. The facilitators commented that the novelty of group interaction helped to engage the students in class discussion. In development, the use of the MDA aesthetics table matched against the

needs analysis helped to identify both class and individual desired game behaviours, such as the competitive element. Game mechanics were then chosen to support both individual and group facilitator led play. Whilst it was apparent from the needs analysis early on that group based play was to play an important part in the delivery of PR:EPARe, the evaluative feedback from the final product suggests that this was an essential part in helping to engage the end users. To support this further, additional feedback on collaboration and discussion was collected in the Contributions and Inhibitions evaluative section. Further research into collaborative play led by a trained facilitator could provide an insight into instilling the engagement that serious games often fall short of.

The use of collaborative play is an interesting area for me as a designer of serious games. A lot of serious games tend to be developed for a single player use as these are thought to act more like simulation experiences. This data has however suggested that certain users might respond better to a group play situation which has led me to consider if serious games should attempt to open up their play style. Using the MDA, helped to ascertain the use of certain group play aesthetics such as competition which I believe on reflection has gone a long way to help facilitate engagement of the students. From this, I will consider the use of group play instead of single player experiences in future developments.

6.1.4 Contributions and Inhibitions Feedback

The qualitative opinions that were gathered involving user participation and contribution shows that students who contributed to whole group discussions gave positive comments on being able to hear what their peers thought about the topic of relationships and coercion [7]. The students who did not participate in a full class discussion were found to voice their opinions in smaller groups of four and less. The report shows that students believed that they had experienced positively from participating in the discussion sections of the game, even in smaller groups, as peer beliefs could be examined and discussed. SASH believed that by examining peer view, students would be influenced to exhibit a healthier behaviour in their relationships by recognising when they are being pressured or they are putting pressure on others [7].

Observations were made on the efficiency of the game mechanics such as the pause and skip functions that were imbedded to help the facilitator. These mechanics were indicated to have improved the discussion element of the game by providing control and direction.

The evidence presented in the report shows that PR:EPARe functioned as the developers intended, providing a game that could be used in diverse class and group setups. An analysis of the feedback suggests that although PR:EPARe worked as a whole group intervention, some pupils felt conscious of voicing their opinions in front of the whole class. In smaller groups however, comments were raised that they felt more comfortable in expressing their views with the impression that they felt listened to. This shows a positive result for the mechanics adopted in development to aid both group and individual work. A key thing to note from the feedback is that a smaller group set up seemed preferable over a larger group set up in the case of examining relationships and sexual coercion. This could be due to the subject's sensitive nature however provides a good insight into game setup for future work in health serious games.

The evidence in the report shows a correlation with the preliminary framework research as to the importance for imbedding practitioner based design into a serious game. The use of practitioner led mechanics to support the delivery and discussion sections of the game have produced a direct result, showing that confidence and control in delivery help to elevate interest and investment in both of the end user groups. Addressing the practitioner as an end user alongside the student fosters a new relationship between the facilitator, student and intervention. This user led relationship provides support for each user engaged with the game and as a result promotes a positive e-learning experience for all involved.

The use of group play as discussed in the last section seemed to effect the engagement of the students with the game. However from this data, it can be seen that smaller groups were sometimes more effective for facilitating discussion within the users. Perhaps this data suggests that the use of group play can be beneficial to the delivery style of a serious game, however, it should look to be developed for smaller group size delivery rather than large group activities.

Considering the data, practitioner support of the game seemed to be high. Whilst this could be for a number of reasons, the inclusion of practitioner support could have gone some way to help this. Whilst further data is needed on this to draw informed conclusions, it is certainly an area that I would like to address further in future works.

6.1.5 Complexity Appreciation Feedback

The SASH researchers observed that the students constantly gave differing opinions on the subject content included in PR:EPARe. As outlined by SASH in one of their change objectives set out to orientate users on the complexities of coercive behaviour, part one of PR:EPARe provided players with informative scenarios surrounding coercion and the different ways that it could affect relationships. These scenarios offered opportunities for participation and discussion between the students. SASH researchers reflected in the report that due to nature of the chosen subject, students were found to give differing views on the subject material. The opportunity provided by PR:EPARe to discuss the material and for students to observe peer beliefs is likely to have aided the perceptive learning processes set out in the game.

The report's findings in this area show positive results for the use of the mechanics implemented to aid in the delivery of the pedagogic content and for the practitioners benefit. The use of the pause button to aid in promoting discussion is reported to have been particularly useful in the delivery of the game and to help facilitators to go over complex material that may need extra considerations.

The aesthetic style of the game set out as a game show is found to provide the right context for delivering the complex pedagogic content. The style allows the students to foster competitive behaviour and promotes the students desire to be right in front of their peers. The mechanics that were chosen to compliment the aesthetics of the game show though these findings a perceived impact on the delivery of the learning experience for facilitator and student.

Using the guidance of the 4DF and the IM approach, the methods chosen to deliver the pedagogic content such as participation and discussion that were embedded into PR:EPARe are shown in a positive light in this report. These findings suggest that the

selection process and the use of these methods in serious games are core principles to consider when designing game-based interventions.

The feedback gathered in this section shows the techniques taken from the methods/frameworks went some way to help identify how to deliver the educational content. Using participation and discussion as some of the driving factors in the game, it was obvious to me that the game needed to instil a sense of competition in the players in order for them to feel engaged with the content. This was added somewhat by the use of the MDA as previously discussed and has highlighted the need to be selective when choosing the overall feel of the game against the objectives.

It has been clear from this data, that developing stronger ties between the game play elements and the learning content is a vital aspect of keeping the users entertained and thus considerate of the values that are being shown. Section two of the game would of benefited from further development in this area in which I believe the mechanics were not properly chosen for the feel of the content.

6.1.6 Consistency of Delivery Feedback

The qualitative feedback gathered in this section shows that each teacher that participated with the evaluation of PR:EPARe approached the delivery in a different way, using personal experience or views to endorse the learning experience. In an effort to guide delivery for the facilitators, SASH created a facilitators manual that can be found in Appendix I. This was implemented to ensure that teachers received guidance on how to use the game, suggestions for discussion and lesson planning guidance. From the information set out in the report the handbook provided a level of consistency to the lessons that PR:EPARe was trialled. However, SASH reports that due to the nature of individual preference in the practitioner, variations in delivery will always occur.

Whilst the report shows delivery consistency was affected by practitioner personal preference, belief that some variation in lesson delivery can stand to be a beneficial experience for the students. Since the report shows a decent level of consistency throughout the delivery of PR:EPARe, the facilitators handbook shows evidence to suggest the part it played in delivering this consistency. As a result, future work in

serious games that involve practitioners should look to include a manual to instruct on the use and guide delivery of the game.

After considering this data, I am now a firm believer that any serious game created should be accompanied with a facilitator's manual or instructions that are outside of the game. Fostering practitioner acceptance is another difficult area to be overcome for serious games with many asking what the purpose of this approach is. Developing material outside of the game can give unconvinced practitioners a way to engage and learn about the product before they even see the game. I believe that this could help teachers acclimatise to the thought of using a game-based approach to teaching and also provide guidance long after game trainers have gone.

As a result this is an area that I would personally be interested in developing for serious games, with a bigger focus on how we can inspire non-adopters of digital learning approaches into using these resources.

6.2 Quantitative Data Analysis

Quantitative data was gathered using self-report questionnaire measures based on the final and definitive performance objectives and change objectives. A copy of the questionnaire can be found in appendix G. The items measured are shown below in figure 30, included: Confidence in knowledge about what feeling under pressure in relationships or coercion is; Personal relevance (as coercer and coercee); negative outcome expectancies associated with coercion (for coercer and coercee); positive outcome expectancies of resisting coercion (as coercer and coercee); self-efficacy to say no; self-efficacy to recognize coercion; self-efficacy to recognize when being coerced; self-efficacy in communicating to avoid coercion (as coercer and coercee); descriptive norm relating to others experiencing pressure and others being able to say no; subjective norms relating to putting pressure on others and saying no to coercion.

	Questionnaire Measure
1	Confidence in Knowledge about Coercion
2	Perceived Personal Relevance for Possibility of being Coerced
3	Personal Relevance for Possibility of Coercing Others
4	Perception that being Coerced has Negative Consequences
5	Perception that Coercing Others has Negative Consequences
6	Positive Attitude to Saying 'No' if being Coerced
7	Positive Attitude to Others Saying 'No' to you
8	Confidence to Say 'No' if being Coerced
9	Confidence to Recognize Self as Coercer
10	Confidence to Recognize Coercion Against Self
11	Communication Confidence if being Coerced
12	Communication Confidence if being Coercer
13	Believing Others Experience Pressure Too
14	Believing Others Say 'No' to Pressure
15	Believing Others would Approve of Responding Assertively to Pressure
16	Believing Others would Approve of you Saying 'No'

Figure 30 Questionnaire Measures

As an example, the change objective, 'Demonstrate confidence in saying no to low level coercion' which can be seen in appendix E, was translated into a measure in the following way:

I feel confident about saying 'no' if someone tries to get me to do something I am unhappy about. Please place a tick ✔ in the box under the words that best show what you think about this.

All questionnaire items were positively phrased, and the responses provided by participants were scored from 1 (strongly agree) to 5 (strongly disagree) when the data were input into statistical analysis software. Thus, a lower score on each item represents a lower risk of being coerced or putting pressure on someone else to do something they are unhappy with and greater psychological preparedness for responding appropriately to potentially coercive situations.

6.2.1 Measure Refinement

To prepare the data for analysis, the questionnaire responses for the 16 change objectives taken at baseline in studies 1 and 2 were combined and subject to exploratory factor analysis, to identify the underlying structures being measured by the questionnaire. The analysis suggested that there were 5 underlying factors represented in the data but questionnaire items only actually loaded onto the first 3 factors. Therefore, the data were re-analysed using principle components analysis with a forced three factor solution and varimax rotation.

Three factors were identified from this which represents the underlying structures measured by the questionnaire. These structures represent:

- Confidence to recognise coercion and act to stop (factor 1)
- Knowledge and positive attitudes towards saying no/others saying no (factor 2)
- Understanding of personal risk and consequences for all (factor 3)

All factors demonstrated reasonable internal reliability with Chronbach's alpha scores of .573 and above. Split half reliability analysis also showed reasonable levels of correlation indicating scale reliability

6.2.2 Descriptive Statistics

Figure 31 shows the mean and standard deviation statistical results from the participants on questionnaire measures by condition (control vs. game) and by time (baseline vs. follow-up) based on part 1 of the game. Some variable scores appear reduced in the game condition at follow-up.

Figure 32 shows the means and standard deviations of participants' scores in study 2 for each underlying factor at baseline and follow up. A lower score indicated in the tables represents greater awareness of the subject matter. A 2(time: baseline vs. follow-up) x 2(condition: intervention vs. control) multivariate analysis of variance showed significant effects for time, condition, and time x condition ($p<0.001$), demonstrating a significantly greater improvement for the game group over time. This indicates psychological preparation to coercive situations from both coercer and coerced perspectives that are represented within the table of results.

Questionnaire factor	Control (no game) condition		Game condition	
	Baseline	Follow-up	Baseline	Follow-up
Confidence to recognize coercion and act to stop Factor 1	2.12 (0.53)	2.08 (0.23)	2.13 (0.42)	2.06 (0.43)
Knowledge and positive attitudes towards saying no/others saying no Factor 2	1.79 (0.47)	1.70 (0.17)	1.82 (0.39)	1.85 (0.44)
Understanding of personal risk and consequences for all Factor 3	2.72 (0.55)	2.97 (0.82)	2.82 (0.50)	2.70 (0.45)

Figure 31Study 1 questionnaire factors by condition and time

Questionnaire factor	Baseline	Follow-up
Confidence to recognize coercion and act to stop Factor 1	2.19 (0.48)	3.10 (1.4)
Knowledge and positive attitudes towards saying no/others saying no Factor 2	1.90 (0.44)	2.33 (1.09)
Understanding of personal risk and consequences for all Factor 3	2.78 (0.47)	2.64 (0.73)

Figure 32 Study 2 for questionnaire factors pre and post gameplay

A follow-up analysis of variance (ANOVAs) in study two produced an analysis that was consulted to identify which change objectives were affected. These findings suggest that there is a slight improvement to awareness for factor 1 but there are no significant (time x condition) interactions on responses to questions 7, 8, 11, 12 and 15 nor over time or by condition of the intervention [79].

6.2.3 Inferential data analysis

A 2 (condition: control vs. game) x 2 (time: baseline vs. follow-up) mixed multivariate analysis of variance (MANOVA) was applied to the data to assess whether the

PR:EPARe game had any impact on the psychological factors identified in the questionnaire data. The MANOVA demonstrated a significant main effect of time (F [3, 501] = 2.847, p = .037, $\eta\frac{2}{p}$ = 0.017), a significant main effect of condition (F [3, 501] = 7.27, p < .001, $\eta\frac{2}{p}$ = 0.048), and a significant time by condition interaction (F [3, 501] = 15.306, p < .001, $\eta\frac{2}{p}$ = 0.084).

This finding suggests that the PR:EPARe game does have an impact on the identified change objectives. In particular the time by condition interaction indicates that there may be changes over time in the game condition compared with the controls that are important. Follow-up analysis of variance (ANOVAs) produced in the analysis were consulted to identify which psychological factors were affected.

For factor 1: confidence to recognise coercion and act to stop, there was a significant main effect of time (F [1, 501] = 4.746, p = .030, $\eta\frac{2}{p}$ = 0.009) but no significant time*condition interaction (F [1, 501] = 0.406, p = .524, $\eta\frac{2}{p}$ = 0.001).

For factor 2: knowledge and positive attitudes towards saying no/others saying no, there was no significant effect of time (F [1, 501] = 1.902, p = .168, $\eta\frac{2}{p}$ = 0.004) but there was a significant time*condition interaction (F [1, 501] = 7.808, p = .005, $\eta\frac{2}{p}$ = 0.015).

For factor 3: understanding of personal risk and consequences for all, the main effect of time approached significance (F [1, 501] = 3.35, p = .068, $\eta\frac{2}{p}$ = 0.007) and there was a significant time*condition interaction (F [1, 501] = 27.717, p < .001, $\eta\frac{2}{p}$ = 0.052).

These findings suggest that for confidence to recognise coercion and act to stop (factor1), an improvement is seen for both conditions overtime. The improvement is better for the game condition but this difference in improvement is not significant. For knowledge and positive attitudes towards saying no/others saying no (factor 2) the control group appear to improve over time compared with the game group. For understanding of personal risk and consequences for all (factor3) the interaction effect demonstrates an improvement for the game condition and not for the control group.

In order to analyse the study 2 data, a repeated measures MANOVA was conducted comparing baseline and follow up psychological factors. There was a significant overall

difference in scores at follow-up compared with baseline (F [3, 254] = 39.812, p < .001,,η_p^2= .320).

ANOVAs demonstrated that there was no significant change for *confidence to recognise coercion and act to stop* (factor1) (F [1, 256] = 1.967, p < .162, ,η_p^2= .008), there was a significant decrease in *knowledge and positive attitudes towards saying no/others saying no* (factor2) (F [1, 256] = 39.625, p < .001, ,η_p^2= .134), but a significant improvement in *understanding of personal risk and consequences for all* (factor3) (F [1, 256] = 9.042, p = .003, ,η_p^2= .034).

These findings mirror to some extent the outcomes from the study 1 findings. Although we now have a null finding in relation to *confidence to recognise coercion and act to stop* (factor1), the impact of the game is again shown to be unfavourable in relation to *knowledge and positive attitudes towards saying no/others saying no* (factor2) but to have a positive impact on *understanding of personal risk and consequences for all* (factor3).

6.2.4 Summary of Quantitative Data

The findings presented from the final report conducted by SASH on the quantitative analysis, show that both studies exhibited similar outcomes except for an increase in factor one – the ability to recognise coercion and act to stop. A null result is now observed for this factor. The results show a negative impact on factor 2 – knowledge and positive attitudes towards saying no/others saying no but a constructive impact on factor three – understanding of personal risk and consequences for all.

Factor 1 shows a null effect from differing results presented in both studies, however after a more robust data analysis carried out by SASH from the CRCT, evidence was found that confidence increased in the participating student body. Furthermore, evidence was found to suggest that confidence could increase in students using the game condition over the traditional RSE classes [7].

Whilst the results for factor 2 seem negative, SASH highlight in their report that the students who were used to evaluate PR:EPARe were unlikely to have been introduced to the topic of coercion in previous lessons [7]. This could provide insight into the

reason students were less confident on their knowledge of coercion after playing the game. SASH suggest in their report that by introducing the topic of coercion to the students they are likely to recognise the complexity of the issues surrounding the subject. This is likely to cause self-reflection in the students and lead to questions about their views.

SASH indicates in their report a definitive positive finding for the results of factor 3. The games objectives are met within this factor of the study, showing a significant increase in students understanding personal risk and consequences.

Whilst these findings present initial mixed results, they do present on the whole a positive outlook for the use of a game-based intervention. SASH indicates that a larger-scale randomised cluster trial will be on-going to determine an extensive examination with a full version of the game [7].

The findings show an optimistic outlook in terms of the development methods chosen for PR:EPARe, particularly in terms of the pedagogic method selection to include participation and discussion in the design of the game. The dynamic interactions that were chosen to support these decisions have yielded positive results within the qualitative feedback seem to match up with results from certain aspects of the quantitative data. For example, the aesthetic choice to include role-play and expression in the game by providing scenarios and play-through that the students could participate in could be the result of the positive findings found for factor three of the evaluation - understanding of personal risk and consequences for all.

The negative findings on factor two - knowledge and positive attitudes towards saying no/others saying no could suggest that the pedagogic content could have been further clarified in the game content, or an initial ‘training’ introduction could have been added before delving into the full game to introduce the concepts of sexual coercion. Extra attention to participatory feedback could also have been used at the development stage of the script to access whether information was given clearly and that the students understood the concepts that were being addressed.

Unfortunately due to a null result with the first factor - the ability to recognise coercion and act to stop, it is challenging to access the impact of the development methods

against the quantitative data gathered. Although addressing the additional data taken from the robust analysis, substantial support is provided for the games ability to help raise student ability to recognise coercion in relationships. This could provide further evidence to support the use of participation and role play in a game-based intervention. Allowing the students chance to act out scenarios and practise responding to potential cases of coercion either as the coerced or coerce, suggests that the student would have a greater chance of recognising similar situations in the real world. However to validate these claims further evaluations would have to be carried out.

Overall the evidence presented in both the qualitative and quantitative data presents an encouraging case for the chosen research and development methods that were adopted from the frameworks analysis. Throughout the feedback and data analysis, evidence is presented of several reoccurring themes that have shown to produce positive results in fulfilling the games programme goals. Positive themes such as participatory design, will be taken forward in the next chapter to produce a new framework where positive features are brought together to create one comprehensive guide to future developments of game based interventions.

7 The DeLHTA Methodology

From the analysis of the evaluation data against the development methods adopted, clear indications of core areas to consider in serious games and interventions development have surfaced.

This chapter presents the core areas found throughout this research into one collected methodology which has been named DeLHTA (Designing e-learning and health training applications). The DeLHTA methodology found below in figure 33 presents the overall findings of this research and presents a novel approach to aid future development and research of game based interventions.

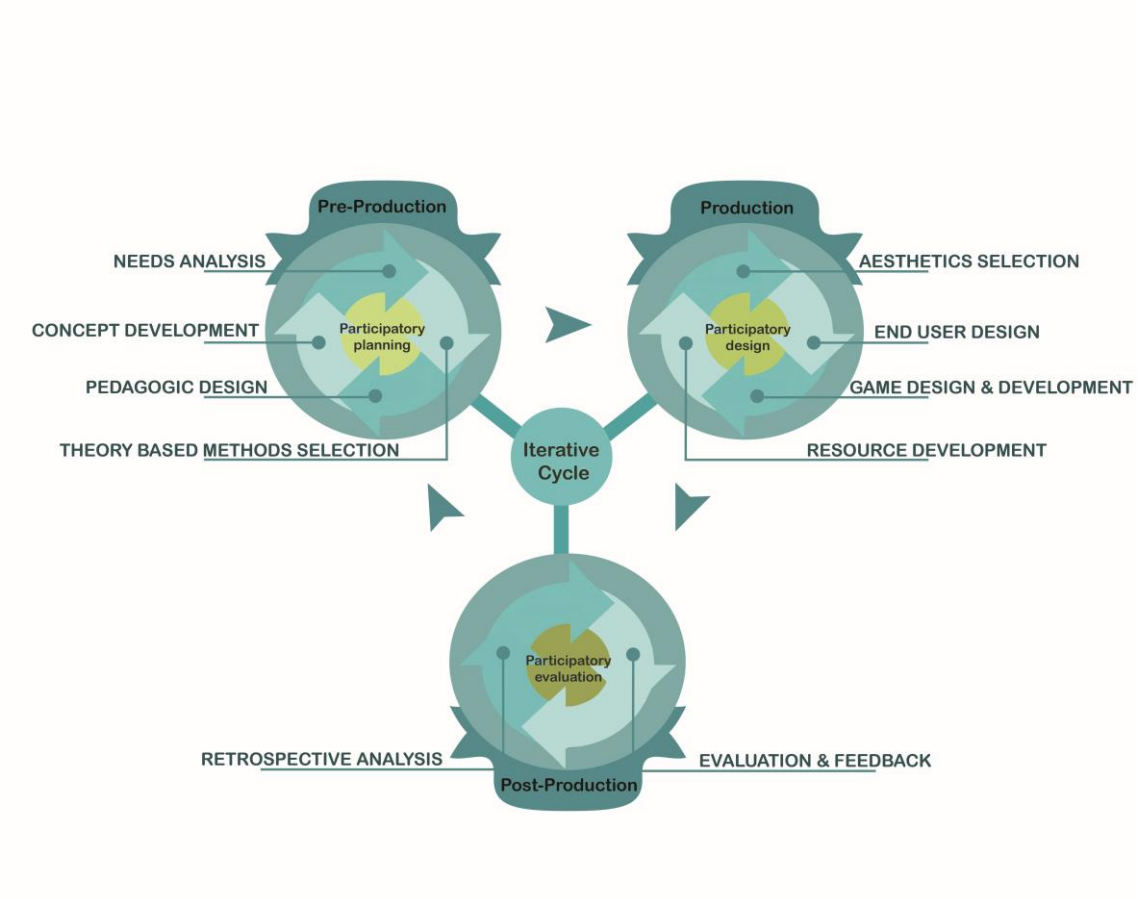


Figure 33 the DeLHTA Methodology

7.1 The Three Phases of Production

The three phases of production are the pre-production phase, the production phase and the post-production phase. Breaking down the productions phases into cycles allows the research and development (R&D) team to assign research strategies into the needed

areas of development. Within PR:EPARe's development, a similar cycle was used, with the needs analysis and the concept development being completed before any practical games development was underway.

For example, following a pre-production cycle before practical development took place, allowed the research and development team to gather evidence and construct educated concepts before applying them to the production phase. This gave way for informed choices to be implemented into the game, by ensuring that all research was carried out and analysed before practical development of the game began.

In short, by adopting this approach, time and resources could be saved by stating enough time for each stage of the cycle from the onset. From this the R&D team can conduct informed decisions before practical production starts and allow enough time for evaluation strategies to be implemented. The three stage production cycle also provides a guide for the R&D team and can be used to provide an indication of time to be spent on each process cycle of the project.

7.2 The Iterative Cycle

An iterative approach was adopted in the development of PR:EPARe and was inspired from the comparative analysis conducted of the methods/frameworks, the 4DF, the MDA and the IM approach. Each of these frameworks suggested adopting an iterative approach in the R&D process of a serious game, to ensure that appropriate feedback was gathered and then fed back through into the games development. This approach facilitated the development of any modifications or variant preferences that were gathered from user testing that were to be implemented into the game's design. In turn, this process was used to aid in developing user acceptance and engagement through assessment and an iterative design approach following user feedback.

In PR:EPARe's development, user feedback was gathered at different stages of the games completion. This initial feedback was used to access the acceptability and usability of the game in a classroom environment. Some of the feedback gathered concerned the visual aesthetics of the game, with practitioners and students commenting on the visuals of the host characters. In an effort to help the users accept the host characters, the developers changed certain aspects of the host's visual style, such as

changing the colour of the female host's hair and lengthening her dress to shrinking the male host's hands in order to address the user feedback. By implementing these changes, the developer's hope was that the users would focus less on the imperfections of the host characters and would be less likely to be distracted by these aspects and more likely to concentrate on the games information. As a result, further feedback came back from the user testing to show that the students were not picking up on these visual aspects that had distracted them before.

After using an iterative approach throughout the PR:EPARe project, the process has shown to be a valuable method of assessing constructive user feedback and incorporating that back into the game whilst it's in its development phase. By using this approach, the developers can go back to any stage of the games production cycle and modify the necessary materials to ensure that the overall user based project goals are met. Furthermore, an iterative approach allows changes to be made to the projects underlying goals if it is found through user feedback to be providing little value as an intervention approach from the chosen methods in the pre-production phase. This approach allows for flexibility and provides greater insurance that the finalised game will be accepted and used as planned.

7.3 Participatory Planning, Design and Evaluation

Perhaps one of the most important findings in this research is the use of participatory research and design to aid the development of serious games. Each of the methods/frameworks suggest the use of participatory design by commissioning stakeholders, subject experts and end users to ensure informed development decisions are carried out.

The MDA model suggests that any games development should begin with the user experience in mind and to do so will provide a game that encourages engagement within the intended user base. By using participatory design at this stage the developer can mould the games design to suit the intended user base.

The IM model uses a series of approaches that involve gathering feedback from stakeholders, subject experts, practitioners and users to form educated judgements and decisions related to the projects theme and material. For example the IM model suggests

a needs analysis step in which background research is obtained and stakeholder and focus group engagement is carried out. The participatory research conducted in the needs analysis is considered a vital part to ensuring that the correct needs and desires are documented in order to provide realistic and obtainable programme goals.

In PR:EPARe's development, each phase of the production cycle, research, development and evaluation, adopted the use of participatory aid. In the pre-production cycle, a needs analysis was carried out with input from stakeholders, subject experts, practitioners and users, to gather evidence to support the game's goals. In the production phase, game development expertise was sought alongside a young person's group to obtain vocal material for the games content. In this phase feedback was also sought from practitioners and students to inform the researchers and developers of the games acceptability and efficiency. In the post-production phase, evaluations were carried out using practitioners and students from the participating schools. In this phase information was gathered and the CRCT evaluation carried out, providing feedback and evidence from the intended end users. This information was used by the researchers from SASH and the SGI to assess the final games efficiency and value.

Each stage required the use of participatory aid to ensure that the development of the game was as accurate as possible. From the use of participatory aid in the pre-production phase, key requests could be implemented in to the production phase, see appendices B and C for examples. From participatory feedback in the production phase, iterations could be carried out to ensure that the game was acceptable and on course for hitting the programmes overall goals.

For example, some end users queried the use of certain visual aspects in the game such as the female host's costume. The result of this feedback found that these aspects were found to be distracting and drew the user's attention away from the game. Using the iterative design process, the visuals could be changed to reflect the objections of the users and develop a positive viewpoint of the characters which was reflected in further feedback after modifications. This was one example of many instances of how the use of iterative design and feedback benefited the production process. As a result this is reflected in the DeLHTA methodology as a key factor throughout a projects design and development process to consider when developing serious games.

Moving into the final post-production phase, the evaluation of the game needed to engage participatory evaluation to gather a complete view of the project from different users. This information was used at the analysis stage to see what worked, needed to be changed or should be removed from the game for future development and application.

Following the use of participatory design in the PR:EPARe project and the reflective analysis conducted from SASH's evaluation data, the findings suggest that the use of participatory design provided the project with evidence from steps taken such as the needs analysis approach to support the projects goals, themes and material. There was also strong evidence from the evaluation to suggest that the feedback gathered throughout the phases insured that PR:EPARe maintained user acceptance by facilitating user based iterative game development. In light of these findings and the practicality experienced through using participatory aid throughout the project, participatory aid has been incorporated into the three stages of the production cycle.

These three stages in the DeLHTA methodology involve participatory research, participatory design and participatory evaluation to ensure each stage of the production is supported by this client based method of R&D.

7.4 Pre-Production Phase

In this section the four areas of the pre-production phase of DeLHTA, is explained and mapped against the analysis findings. The pre-production phase of DeLHTA covers the background research, concept developments and material development before physical production of the game begins.

7.4.1 The Needs Analysis

The needs analysis is an approach taken from Bartholomew's IM model [1] and was a method adopted by SASH in the pre-production phase of the PR:EPARe project. A needs analysis is a method to assess the intended health related problem and its conditional determinants in order to highlight the overall programmes goals of the intervention. A planning group is used to assess behavioural and environmental factors of the health problem with the help of a logic model, in the case of PR:EPARe the model was based off Green and Kreuter's PRECEDE model [50].

In the needs analysis adopted by SASH for the development of PR:EPARe, the evidence that was to be reviewed in this stage was gathered from initial professional and young person's (12-16 year olds) stakeholder meetings that developed ideas on the needs and wants of a game based intervention. In this stage SASH identified issues and content from the initial stakeholder feedback and a secondary selection of stakeholder meetings and found similarities between certain issues and concerns raised. These issues were taken forward to form recommendations for the games topic, content and goals. The evidence gathered from the needs analysis allowed SASH to draft overall programme goals in an effort to focus the production of the intervention. This was then validated by steering group's members who agreed that the intended projects topic and goals would provide a relevant and useful addition to the present RSE curriculum.

The evidence presented from SASH's evaluation and the analysis provided from the data shows that the needs assessment provided a vital insight into the needs, concerns and wants of the intended clients, practitioners and users. By gathering information from staggered stakeholder group meetings and analysing the feedback, arising similarities in the data could be used to form a clearer reflection of what the intervention should encompass. This process forms a fundamental point to the development of a game-based intervention and incorporates the use of participatory design into the development methods. The needs assessment strategy utilises evidence gained from involved sources which should have an invested interest in the intervention approach. As such, evidence gained from these sources should contain insightful factors to be considered as to the format and development of the intervention.

To conclude, the use of the needs assessment carried out in the pre-production phase is indispensable in the development process in order to determine client and user based recommendations to support the intervention. Without the support from the stakeholder feedback gathered in the needs analysis approach, the overall research to the project would become less accurate concerning the essential requirements of the intended client and user groups. This in turn could affect the overall acceptability, engagement and efficiency of the intervention.

7.4.2 Theory Based Methods Selection

The theory based methods selection is an approach adopted from Bartholomew's IM model [1] and is used to help identify the methods and practical strategies needed to deliver the objectives of the programme goals. This approach should be developed alongside the pedagogic design section, so that educational goals are set out and mapped with the appropriate methods of delivering the content to the users.

This technique of theory-based method selection was adopted by SASH in the pre-production phase of PR:EPARe to identify the methods and practical strategies used to deliver the change objectives set out in the IM step; programme objectives. This was done to ensure that the objectives set out would have the best chance of users identifying with them and as a result the overall programme goals would be met. The method selection table can be found in Appendix F for further reference to which objectives were mapped to which methods.

As an example from the PR:EPARe method selection table, one change objective outlined from the programme objectives state that users need to *identify continuing to say no to coercion*. The methods that were adopted to help deliver this objective were identified as participation, discussion and feedback. Using these identified methods, the application of these were then developed into the game content to allow players to identify saying no as a possibility and were then reinforced through feedback. As a result to this approach, the development team were provided with useful instructions as to how objectives were to be met and how information was to be delivered through the games content.

In the overall process of theory-based method selection provided informed choices that were to be set out in the concept document. This process provided the much needed data to support the process of developing the games theme and base mechanics. In essence this approach saved the development team time and resources because the methods had already been mapped out ready for the concept document and development meetings. With the development and design team knowing that certain methods had to be used in order to obtain the programme objectives, a focus was drawn in pre-development

meetings to relevant material and thus this ensured that the concept and design of the game followed specific set instructions to its development.

The evidence provided in the evaluation data to support this approach for future game and intervention approaches show that one of the methods chosen, discussion, were linked to positive qualitative feedback expressed by both students and practitioners whilst using PR:EPARe. The method of discussion and its related means such as participation and feedback were chosen to deliver specific programme objectives set out by SASH. The reflective analysis of this data proved to show positive results with comments being made as to the useful application of this chosen method. Students were reported to have enjoyed contributing their opinions and hearing their peer's views. Equally, practitioners were keen to express that students seemed to be involved with discussions and were engaged throughout the play-through of the game.

To conclude, a method selection approach provides a base for the games objectives and application techniques that the development team can work from without having to waste valuable time and resources beforehand. This approach combined with the pedagogic design section, provides assistance to the development team in order to underline the material that is needed to ensure an efficient game-based intervention is developed.

7.4.3 Pedagogic Design

The pedagogic design section of the DeLHTA methodology is intended to be developed alongside the theory-based methods selection, providing pedagogic theory and objectives for the methods to be mapped against.

The step from the IM model that SASH adopted in the development of PR:EPARe incorporated the need to outline programme objectives in order to achieve method selection, the process incorporated into this design model outlines pedagogic considerations and theory before method selection can take place. This approach is developed from both the IM and 4DF models with an emphasis on the pedagogic theory and content that the game needs to consider to provide an efficient approach to serious games development. These models are also combined to provide a wider scope for

serious game development, drawing focus to pedagogic objectives alongside health and intervention objectives for assistance in all serious game development.

Based from the IM's programme objectives step, the pedagogic design section of the DeLHTA methodology incorporates the task of underpinning the learning objectives to be integrated into the game. Outlining clear learning objectives early provides the development team defined goals to achieve in the production stage. Furthermore, methods can then be selected from this process, ensuring that the right learning objectives are matched with the right methods and application.

The Pedagogic design section highlights the formal and informal learning processes that are to be implemented into the project in order to achieve the programme's overall goals. This section makes use of the information gathered in the needs analysis and instructs the development team to formalise the feedback gathered from this process into learning objectives to be set out in the game. Pedagogic theories are reviewed at this point to ensure that the intended learning content is compatible with a technological delivery. Such theories to support these claims include the constructivist theories [61], which encourage experimental learning.

Of course, other pedagogic or learning theories can be considered in place of the constructivist theory and are often found in serious games. Other theories such as collaborative learning are often used in group based serious games for triggering learning mechanics that apply to social situated conditions. Other serious games target the use of the behaviourist approach to pedagogic design that use mastery learning to modify behaviour. Whilst the IM and the 4DF favour the constructivist method, various pedagogic theories can be used and blended to create the desired end effect.

The evidence to support this sections inclusion into DeLHTA, stems from the similar approach of the IM step; programme objectives, used by SASH in PR:EPARe's development. By outlining the projects goals and the change objectives that were to be achieved in the project early, a focus was drawn to how the development should take place. This also informed the development team of how certain aspects of the game should be designed to incorporate change objectives and learning instructions. Finally, knowing goals and learning objectives from an early start allows for additional time

developing evaluation strategies and ensuring accurate methods are being adopted for the games evaluation phase.

7.4.4 Concept Development

The concept development phase is used to bring together all of the previous elements gathered from the pre-production phase and are then fleshed out and fitted together to form the game's overall concept. To aid this, a concept document is put together to show the flow of the games theme, content, the learning objectives, visual style, script and all other aspects that need to be considered in order to develop the game. The concept document provides a good reference point for all involved in the project's development which is especially useful when different teams are working on different sections of the game. Using a document ensures that each team is kept up to date with the relevant project and games development information.

In the development of PR:EPARe, an initial concept document was put together by SASH which can be found in Appendix A. This document provided the lead designer with all of the relevant information that had been conducted by SASH previously. The document contained amongst other important data, the learning objectives and materials that SASH had developed from the pre-development approaches such as the needs analysis and the theory based methods selection. By presenting a concept document in the early stage pre-production meetings, every member of the team, regardless of their disciplinary background, could follow the intended course of the games development. In short, this document allowed the SGI development team to quickly come up with themes and suitable suggestions to fit the needs that had been outlined by SASH in the document, saving time that would usually be wasted on suggesting detrimental proposals.

In this phase of the DeLHTA methodology, all elements of the game should be brought together to create a framework of a working serious game. This is the final step before production starts, so it is important to flesh out ideas and incorporate the adequate research into the games concept before development starts. This approach ensures that the development team are using their time wisely and following precise instructions set out in the document. This is an iterative process so reviews should be conducted when

development starts, however it is advantageous to provide a solid concept before development begins.

The concept stage requires that the flow of the game is laid out and fits all of the intended learning and programme goals. Technical specifications are discussed at this stage to ensure that the end product meets the end environment with no difficulties, with specialist hardware considered. Programmers are consulted on the coding, software or hardware requirements of the games development and are instructed to flag any difficulties for seen with the intended concept laid out. Designers are consulted on the game design, user design, mechanics, visual aspects and overall style of the game to help provide an engaging experience for the users and deliver an entertaining game. Researchers and subject experts are also consulted to oversee the production, help maintain the learning content of the game and ensure that research objectives are being met and the interventions information is being delivered correctly.

After using this approach in the PR:EPARe project, the evidence obtained for the inclusion of this section in DeLHTA, is derived from the personal experience of the lead designer. Using a concept document to control all of the games vital information provided an easy way to share this information across different teams working on the game. Having developed most of PR:EPARe's conceptual work from the initial concept document that SASH provided before production began, allowed the development team to focus on the factors and time involved for each section. Without the concept development from an early point, alongside the document to use as a reference point, a lot of time would have been wasted on developing unnecessary assets and explanations.

As an example to support this theory, the concept document was used to help explain the technical requirements of the game to our technical development team based in Singapore. Language barriers and time issues provided problematic experiences in this area; however by using the concept document, the Singapore team could read a detailed explanation with the relevant images to gain a greater insight into the goals that the team was looking to achieve.

To conclude, personal experience from the PR:EPARe project indicates a strong emphasis of concept development at an early stage in a production cycle. Experience

suggests this is a necessary step to ensure that the project meets goals and is developed according to the needs and requirements of the clients and users. Once concepts are developed they should be documented with a concept document to outline the games elements and concepts. The process of concept documentation is invaluable, especially when working as part of a participatory project with multiple teams with multi-disciplinary backgrounds.

7.5 Production Phase

In this section the four areas of the production phase of the DeLHTA methodology is explained and mapped against the analysis findings. The production phase of the DeLHTA methodology follows on from the pre-production cycle with the first two sections of the production phase, Aesthetics Selection and User Design section transitioning from theory to practical application. This phase begins to lay out the practical applications of developing a serious game by using the information and concepts laid out in both the pre-production section and the first half of this production section to start practical development.

7.5.1 Aesthetics Selection

Whilst this section is applied in the production phase of the game, this should be considered alongside the concept development section in an iterative development method.

In this section attributes from the MDA approach are considered to aid in the development of a game-based intervention approach. The MDA encourages the use of selecting user experiences to aid development of an engaging game. These user experiences suggested by the MDA which are outlined to include fantasy and competition can be used to connect the chosen methods and applications that have been previously laid out in the pre-production section and attach a suitable game and user experience in order to maintain a coherent game.

To shape the experience of the game and encourage user engagement, once delivery methods are outlined by matching pedagogic objectives to theory-based solutions, game experiences based from the MDA approach should be chosen to compliment the chosen delivery methods. For example, if the pedagogic objectives outline delivery methods

that consist largely of users experiencing role-play to achieve results, then a user experience such as fantasy should be chosen to achieve a style suitable for the games material.

Consulting the MDA, showed game-based user experiences that matched up with the intended delivery methods, allowing for a game to be compatibly designed alongside the pedagogic objectives set out. This approach was adopted in the development of PR:EPARe, using game experiences from the MDA to link with the methods set out for delivering objectives. By combining the IM and MDA approaches to delivering objectives and content experiences, a representational frame quickly emerged concerning the base functions and game content.

The evidence to support the use of this method is drawn from the feedback in PR:EPARe's evaluation, which highlighted the users engagement with the competitive nature of PR:EPARe. The use of competition instilled into the game was taken from the aesthetics table to complement the methods and applications set out by SASH in the pre-production phase. The evaluation feedback commented that the students accepted the competition within the game and as a result appeared to think about and respond carefully to the questions presented. The students seemed to care about their answers and as a result a greater level of attention to the concepts and material presented was displayed.

7.5.2 End User Design

This section highlights the necessity of good user based design, with an emphasis on design for all intended end users of the product.

As the PR:EPARe project required a facilitator to deliver the game in a classroom environment with differing class sizes, it was important to address that the end users in this project were to be the facilitator and the student. This led to an in-depth analysis of practitioner centric design as well as the learner centric design to ensure acceptability and engagement was achieved on every level of the game.

Traditionally serious games tend to focus solely on the learner and forget to develop the practitioner needs. An effort made in this area will allow practitioners to feel that the

game based product they are delivering is an efficient and simple to use, educational tool.

To address practitioner design in the project PR:EPARe, the development team applied several functions that would aid the delivery of the game. These functions included;

- Pause and Skip function – These functions allowed the facilitators to control the speed of the game. If further discussion was needed on a particular area of the games content then the facilitator could pause to allow discussion to take place without missing other content. If the facilitator needed to show game content again to ensure that the class have covered the material in full then they could use the skip function to skip back to previous material.
- Timer – The timer function was installed in part one of the game to help control the pace of the game, and to help combat students dithering too much over one question. This function was installed to help teachers manage their lesson planning and provide help towards time management.
- Feedback Screen – This function listed all of the main points of consideration for the topic of coercion for each area of the game. This provided a summary of the key points for class discussions.

By adopting these kinds of functions in to the project's design that are primarily useful to the practitioner, the developer hopes to achieve a level of acceptability and engagement as specific design choices have been made to acknowledge the practitioner as an end user. In turn the choices made from a practitioner centric design point, are made to encourage ease of use and delivery of the final product.

Addressing the needs of the learner as the end user, the game has to be both an engaging game experience alongside a higher level learning experience in order to fulfil the goals of a serious game. In order to tackle this in PR:EPARe, aesthetic choices were made to compliment the methods and applications set out by SASH in order to achieve programme and change objectives.

The theme and content that was chosen to compliment the aesthetic choices were based off research into popular media and culture such as family games like *Buzz* on the PS3 and the *X Factor Show* in an effort to identify with a younger audience as the end user.

Using this research and combining the pre-production research in to the overall concept, the theme and content of PR:EPARe was to centre around a game show. By using these concepts the developers wanted the student users to feel comfortable using PR:EPARe by adopting a theme that they could identify comfortably. The theme chosen also led to providing a stable environment to introducing the learning content, as a game show is likely to ask questions, receive answers and be a learning experience in itself. By using a combination of a thematically based environment, visual styles, scripts and aesthetic experiences, PR:EPARe was developed to be fun to play for the student user. The developers wanted to encourage a fun and playful experience for the student user in order to lead to a vested interest in the content and thus aiding the learning content to be absorbed.

The evidence needed to support the use of the end user design section in DeLHTA, is gathered from the reflective analysis of the SASH evaluation data in this research.

In response to the practitioner centred design that was adopted, the feedback shows that comments made from the practitioners stated the practicality of the functions such as pause and skip. These were listed as being valuable functions in helping control the delivery and flow of the lesson. In evidence to support the leaner centric design employed, comments were raised that the students were engaged with the competitive element and theme of the game and as a result the students were found to be active in the discussion based activities.

7.5.3 Game Design & Development

This section of the DeLHTA methodology supports the main practical applications in the development of a serious game.

In this phase, the development team pulls together all of the essential research and designs conducted so far by the team in order to begin the material development of the platform. All aspects of the game should be established by this phase, and principle members such as programmers, designers, researchers and users should be notified and included at this core stage of the project.

As an iterative process, development conducted at this stage should be open to user feedback and iteration to ensure that the games development fulfils targets such as learning objectives and shows acceptability within the user feedback.

This stage encompasses all of the physical and technical aspects of the games development, evidence is not needed to endorse the use of this section in the DeLHTA methodology. This step is a purely a developmental stage, an essential process in order to create the platform in which the game and learning content is held.

7.5.4 Resource Development

This stage of DeLHTA is used to define and create any additional resources such as facilitator or user guides that can be used to support the serious game.

To aid the delivery of PR:EPARe, SASH developed a facilitators manual that held advice on how to navigate the game, suggested activities, discussion topics and material and held information of contacts for additional support. The manual was designed to act as reference point for the facilitators, support and outline the learning outcomes and aid ease of use. Furthermore, the manual provided the facilitator with an instruction on how to guide the lesson; this allowed a level of consistency in the delivery even considering teachers various delivery approaches. The facilitator's manual can be found in Appendix I.

The evidence provided in the research analysis shows that some of the main benefits of providing additional resources alongside the game are the guidance and consistency elements that arise with their use. In an effort to ensure that the game is delivered and understood in the correct manner, it is important to provide additional guidance which can be accessed outside of the game. It also provides a method for facilitators to understand the game and its concepts before applying it in the classroom setting. In doing this the facilitator should feel comfortable applying the game which in turn should promote acceptability and engagement in the facilitators, one of the end users.

7.6 Post-Production Phase

In this phase of DeLHTA, evaluations are carried out and final user feedback is gathered to form conclusions on the efficiency of the final product.

7.6.1 Evaluation & Feedback

In the evaluation and feedback stage, the main testing of the game is carried out, with quantitative and qualitative data being collected. An evaluation strategy should be formed and participants should be gathered by the research team with formal testing applied at this stage.

In the PR:EPARe project the method adopted by SASH to evaluate the game's efficiency relied on gathering both quantitative and qualitative feedback from the participating schools trials.

The qualitative data was gathered by members of the research team that observed the delivery of the game in the schools. Verbal feedback was gathered from both students and practitioners and recordings were taken of the class play through of the game. Researchers also asked students and teachers for feedback and suggestions at this stage on how they perceived the game and what could be improved.

By gathering both sets of data in the evaluation phase, a clearer indication on the efficiency of the game and its user impact can be gathered in order to provide data for future works and development.

This section of the DeLHTA methodology is essential in the process of developing a serious game. Without the evaluation and feedback phase, the game cannot be tested on the intended target user groups and data cannot be gathered to see if objectives of the programme were met.

7.6.2 Retrospective Analysis

The retrospective analysis is the final stage of DeLHTA, and is used to conclude the project. This is a designated time to consider and analyse the data gathered from the evaluation and feedback stage, and then bring the whole team together to discuss the value of the methods used in the process.

In this phase, results are discussed and fed back to all required members of the team to allow a reflection on the learning objectives and development methods that have influenced the data findings. Reflecting on the methods adopted in the R&D process, and using the evaluation data as evidence to support or criticise the choices made,

provides the development team of a deeper understanding of what works when creating a serious game. Using this evidence, the areas that worked in the process can be documented and stored to provide future guidance. It also allows for the team to build upon the game they have created so far using the iterative development process. Further versions of the game can be created by modifying the needed areas that have arisen from the data analysis.

To support the use of this methodology, the application of a retrospective analysis has inspired the development of DeLHTA by providing the needed data and evidence to support the developments methods that yielded positive results. The DeLHTA methodology will as a result be used to guide future works with further evaluation and aid projects in the area of serious games and game based intervention approaches.

7.7 Summary of the DeLHTA Methodology

The combination of intervention design, pedagogic theory and games design is brought together to create DeLHTA, and in doing so addresses a significant gap in the field of serious game development and research. From the research conducted in the process of the thesis, there was a clear absence of development strategies that targeted serious games as interventions in the health sector. Although there was a particular interest in health serious games targeting physical rehabilitation, there was little evidence to support serious games design that targeted change in psychological attitudes and behaviour. As a result, the DeLHTA methodology has emerged to address this need and go some way to help the research into efficient techniques of combining intervention design with serious games.

In comparison with the IM, 4DF and the MDA methods, DeLHTA offers a combination of the key features from each, that show benefit in the development of intervention based serious games. Since each of the methods target a discipline related to each area of the project, DeLHTA offers a unique combination of the subject matter considerations that result in a design method that is not generalised to fit all serious games development. Providing a focused approach in the method allows the developers to consider what pedagogic strategies are relevant in designing an intervention approach rather than adopting generalised considerations such as the 4DF offers.

In short, in order to produce serious games that are efficient and achieve learning objectives or behavioural change, there is a need to develop methodologies that target specific challenges. In this, DeLHTA is unlike the IM, 4DF or MDA methods as it focuses on a specific problem in game-based intervention solutions. It addresses the need to develop a more specific approach to serious game design and development rather than produce generalised methods or assumptions that a 'one size fits all' development style is beneficial to serious games research.

Since the DeLHTA methodology specialises in bringing together intervention techniques with serious games, the method brings to light approaches that could be adopted for other interventions or serious games development outside that of PR:EPARe. The combination of these fields and their research means that DeLHTA capitalises on each area and delivers what is believed to be the key areas for consideration in design and development terms.

In relation to intervention design, DeLHTA adopts the use of the needs analysis, theory based methods selection and resource development amongst other factors. These elements are part of the core process according to the IM approach in developing successful intervention approaches and as a result, DeLHTA could be used to provide guidance in this area. Since the DeLHTA methodology targets the use of interventions in technology, particularly serious games technology, the method would be most suitably adopted in the design and development of a games based intervention approach. However due to its wide range of considerations, some of the factors could be used in consideration of an intervention that is based outside of the realm of serious games.

The DeLHTA methodology could also be adopted for designing serious games that are outside of the field of intervention approaches for a similar reason. Whilst the method is specialist and would show the greatest benefit applied in the targeted area, it offers up areas such as pedagogic design, aesthetics selection, end user design and a selection of other factors that benefit games and serious games design. Even the needs analysis that is primarily an intervention approach is one that most designers/developers embark on before developing a serious game.

As a result, most of the factors highlighted in DeLHTA can be adapted to fit the needs of the developer and the project. However, careful consideration is needed when looking to apply the method outside that of a technological process in order to ensure that the method is the right choice for the style of the project.

7.8 Further Evaluation of DeLHTA

The purpose of the research was to develop a preliminary method that arose to benefit the development process of the PR:EPARe project. As such, the DeLHTA methodology highlights the factors used that appeared to provide successful results that are applicable to the development process of PR:EPARe and no other game. Since this is a preliminary study to identify concepts that could benefit the design and development process in future game based intervention approaches, further evaluation is needed to determine the overall efficiency of DeLHTA, and its impact on other games and intervention approaches.

To approach this, the researcher proposes that the DeLHTA methodology is adopted in future works that target development of game-based intervention approaches to assess how the method affects the outcome of various types of projects. It would also be beneficial to use this method in the production of serious games that are not intervention based and that cover a wide range of subjects to assess any impact that this method has. This should be carried out alongside a second study using a method such as the 4DF to determine any distinctive data between the two methods.

Finally since this research is a preliminary report and the data used to develop DeLHTA was gathered from SASH's questionnaires and reports, a proposal for future evaluation is to develop a method of data capture that is specifically designing for the evaluation of the method. This would address and complete the last stage of Kolb's experiential learning cycle that was adopted to map this research through the step of Active Experimentation. The data should reflect the reactions and responses from researchers, developers/designers, stakeholders, practitioners and end users on the DeLHTA methodology to achieve a more complete analysis of its efficiency. Only from further evaluation data and analysis can DeLHTA be accepted as a valid approach to developing game-based intervention approaches.

To summarise this chapter, the DeLHTA methodology presented in this research shows the overall conclusions of the work and evaluation analysis conducted on behalf of the PR:EPARe project. The research presented in this chapter shows the positive findings from the evaluation analysis, with strong indications of the need to address participatory design, user design and learning objectives in order to create an engaging and efficient game. These findings reflect similar issues that have been brought to light in the MDA, 4DF and IM frameworks and carry through to form areas to consider in the DeLHTA methodology presented above.

Furthermore, DeLHTA presented above, presents the aims of this research project by presenting a preliminary study into the key areas to consider when developing a serious game or a game based intervention approach. Thus the overall objective is obtained by bringing these key areas together to form the DeLHTA methodology, an approach which will provide support and a programme plan to follow in order to help develop future educational and health based games.

8 Conclusion & Future Works

8.1 Summary

The process of developing a game based intervention approach for the use in relationship and sex education has proved to be a complex process involving the need of a multi-disciplinary team and a suitable development methodology in order to achieve the programme goals. Without a clear development methodology, the process of producing a serious game can become lost, with misleading information being implemented and focus easily diverted to other areas of the project.

In order to avoid this and ensure that the programme's goals are met whilst developing a game that is engaging and acceptable to the end users, accurate guidance must be sought. This thesis has set out to define and produce such a guide, which provides appropriate and efficient development methods for the production of a multi-disciplined game. This challenge has led to the development of the DeLHTA (developing e-learning health and training applications) methodology, derived from the evidence presented by the approach adopted in the project PR:EPARe, which is intended to provide a design guide for future projects ad research in this area.

The final version of PR:EPARe used in the evaluation phase set out in this research indicates that it was overall well received by both the students and facilitators that were involved in the assessment process. Positive comments were made concerning the chosen topic of sexual coercion and feedback indicated a perceived usefulness felt amongst the students and practitioners of addressing this topic through a game-based intervention approach.

Focussing on the students perceptions of PR:EPARe, qualitative feedback from the evaluation indicated that most of the students found the game was acceptable for their age group and that they found it a valuable experience for discussing their views and listening to their peer's opinions (age 14-16). One class however, stated that they found the game too immature for their age group [7], which indicates that practitioners will have to judge which classes will have a higher acceptability of the game.

Focussing on the practitioner based views of the game, the evidence shows that practitioners found the game a useful resource, with all practitioners involved in the

evaluation stating that they would use it again in future RSE classes. A testimonial gathered by SASH which is shown below [7], shows a facilitators thoughts on the use of the game to aid discussion on the topic of sexual coercion.

> *"I found the 'Serious game' to be an excellent stimulus for discussion in my y9 lessons as it provides situations relevant to the students in an attractive game show style format. The students are engaged in an active way and the material whilst appropriate was far more than I would have been able to produce by myself in teaching the important issues around sexual coercion. It is particularly useful for me personally in teaching PSHE as I find discussion work difficult to initiate but understand the importance of it in developing the attitudes and therefore the future behaviour of my students."*
>
> Statement from Pam O'Mahoney, Secondary School in Alcester, Warwickshire [7]

Another statement gathered by SASH [7], which perhaps gives a bigger indication of the games overall efficacy and use is shown below, and reveals that even in the short term usage of PR:EPARe in its evaluation phase, a student has come forward to express concerns of coercion in their life.

> *"We were approached to trial an innovative piece of software which focuses on the concept of coercion in relationships. Being a PSHE Association Charter School, we had no hesitation in taking part in this trial.*
>
> *The whole PSHE team found the software to be engaging with the Year 10 students who worked with it. They enjoyed the simulations that played out in front of them, and were very keen to make sure they chose the correct response.*
>
> *Pertinently, the level of discussion which took place during the lesson and in follow up lessons was really thought provoking, so much so that it made some students question the relationships they were in, and even led to a disclosure of a serious nature that we were able to provide support for. We will certainly be running this unit again this year."*

Statement from Sean Taylor, PSHE Association Chartered Teacher, Secondary School in Henley, Warwickshire. [7]This statement shows that the game provides an informative approach to

tackling the issue of sexual coercion and as a result leads the students to consider the experiences and choices they are facing within their own lives at the present moment. With support from the game's information and the practitioner's delivery and encouragement, the students can make informed decisions concerning coercion with how they act and how they behave towards family, friends and partners.

The research laid out in this thesis has provided an in-depth assessment of the current methods/frameworks used to aid serious game and intervention design in present academia. Key elements of these methods/frameworks have been researched, used in the development of PR:EPARe and then reflected upon to form an assessment of the relevance these elements hold when developing a serious game.

The elements that have been gathered to form the preliminary version of the DeLHTA methodology are shown through evidence in this research to provide a benefit in aiding the development process. The elements that have been taken from the research conducted of the three frameworks laid out in this thesis, the MDA [46], the 4DF [3] and the IM approach [1], show strength in their particular areas, be it health and intervention design or entertainment games. Combining the use of these different disciplined framework elements has allowed the development team to address the different disciplined areas that needed to be considered in the production of this project such as but not limited to; education, design, engagement and behavioural factors.

The successful elements shown from the initial evaluation analysis have been gathered to achieve the primary objective of this research; the development of a preliminary method for game based health interventions entitled the DeLHTA methodology. DeLHTA shows the amalgamated core aspects of these multi-disciplined frameworks which have provided aid and guidance in the development of PR:EPARe.

Finally, the DeLHTA methodology that has been produced in this research shows promise as an efficient and supportive procedure guide to developing serious games and game based health intervention, as it has adopted only the perceived effective methods that were used in the project. By adopting the procedure set out in DeLHTA, personnel researching and developing a project like PR:EPARe have a guide that looks at each of the disciplinary considerations be them game design or pedagogy and instructs

throughout each iterative step of the process. This research has shown initial successful results in achieving the overall set out objectives and aims through the documentation of the key development methods to apply in serious games design and the subsequent design of DeLHTA.

8.2 Contributions

The gap in the current research surrounding targeted serious game methods and frameworks shows a need to develop approaches that focus on the fields that the game is trying to address. Whilst the current literature on serious games development offers up considerations into pedagogic design and technology such as the 4DF does, these are often vague and show little more than passing thought to integrating specialist material.

Shown in the research, there is also very little crossover in the research that links serious games methods to entertainment game methods in terms of mechanics and aesthetics design. If the field of serious games design and development research is to advance then we as researchers must do more in terms of integrating specialist subject matter into the development process. As most areas of research will demonstrate, one size does not fit all and if serious games are to advance then a new approach to developing accurate and focussed design and development methods must be embraced.

In this research, the main objective and contribution was to address this problem and create a preliminary method that focused on and combined intervention methods, serious games theories and entertainment game techniques. The final outcome of this research, the DeLHTA methodology, addresses the gap in the research and the need of a procedure that targets development of game-based intervention approaches. Using the combined practises from the IM, 4DF and the MDA approaches as reference to each field, DeLHTA highlights the core elements that were shown to yield positive results from the pilot evaluation. By approaching the research in this way, some of the key factors of the DeLHTA methodology, such as participatory design and practitioner user design, have been found to provide significant impact on how a serious game in this field is designed and received.

Other contributions to the field of serious games are highlighted in the breakdown of the DeLHTA methodology. Preliminary findings suggest a strong case for further research

into using participatory design in aiding development in future serious games. Whilst this area has been initially designed to fit the requirements of the PR:EPARe project, there is evidence to suggest that the adoption of participatory design could go some way to improving acceptance and motivation in end user participation. Using participatory design throughout the project, underlined needs, issues and presented vital feedback that informed an iterative process. Attending to the needs of the stakeholders, practitioners and end users and using their advice may have gone some way to help the overall engagement that was found in the trial periods of PR:EPARe.

Additionally the research contributes a significant look into end user design, with particular focus on developing user design approaches for the practitioner or educationalist that has to deliver the serious game. Serious games research often labels the end user as the student and little thought is given to the delivery of the game, or how a teacher may engage with the new learning tool.

This research has addressed some of these issues and used practitioner end user design to inform some of the design decisions adopted in PR:EPARe. From the reports, there seems to show an overwhelming support in favour of these approaches concerning aspects such as the facilitator's manual and the use of in-game mechanics to aid lesson planning. These considerations have informed the design of DeLHTA in that it has a section which targets the need to consider practitioner user support as well as student user support.

The impact that the DeLHTA methodology could have in serious games research after further validation could see a change in how serious games researchers approach development. So far the PR:EPARe project has shown some interesting findings in terms of the efficiency of the game. The quantitative data shows both positive and negative findings to indicate that students understood the topic of coercion which brings into account the need for further testing with the game and its educational content. However the qualitative findings show some very positive results in terms of acceptance, motivation and engagement with the game. Both students and practitioners commented on the useful and entertaining factors of the game, with group play and discussion observed as being a key influencer in this. More importantly, students have

since come forward after playing the game voicing concerns over coercive situations they believed they were in and as result help is being delivered.

The games perceived success from the qualitative data and the resulting information that has been brought to light by at risk students, indicates that some of the aspects of DeLHTA have made an impact in the development process and have influenced the final outcome for the better. With further evaluation data of DeLHTA, evidence and conclusions can indicate what aspects of the method show positive or negative impact on design and development outcomes with end users. If further testing can show that DeLHTA provides significant results on developing engagement, motivation and efficacy in this field of serious games, the impact will change not only how we develop game-based intervention approaches but call into question the use of generic serious game frameworks and methods in future works.

8.3 Future Work

The next step in developing the DeLHTA methodology would be to apply the approach to a series of serious games development processes that would include both intervention approaches and other fields in serious games. Since the method was created to fit the needs of PR:EPARe, further use of the development method in serious games outside of the project would be the first step to an accurate evaluation. Since the DeLHTA methodology highlights several factors that could be applied to any serious games development practise, evaluating its impact on various game subjects could indicate its use outside of game-based health interventions.

Applying DeLHTA in the development of another serious game or game based intervention means an evaluation strategy that is relevant to the research can be designed and carried out on the approach itself and examined against various users' feedback, including the development teams, stakeholders, practitioners and end users. Since the data that was used to create the DeLHTA methodology was taken from an evaluation designed by SASH, future work involving the method would require an evaluation that targeted gathering data concerned with the methods efficiency.

Developing an evaluation strategy that questions the use of the DeLHTA methodology is vital in the next stage of this research and would incorporate areas such as ease of use, acceptance and engagement with final product.

This information could then be used to assess any relevant findings as to the overall effect of the method. Furthermore any data found this way could be mapped against the original findings of the PR:EPARe project for furthering its validity.

Future work is also on-going with the PR:EPARe game due to its positive feedback and findings from the students and facilitators. SASH are intending to expand the impact of the PR:EPARe game in RSE education by delivering it across the whole of the West Midlands region and then finally look to expand it across the country [7]. Additional evaluations with larger sets of schools and participants are also planned in order to produce a larger scale of data for further analysis and a greater comprehension of the impact and efficacy of PR:EPARe.

To conclude, the PR:EPARe blueprint has been used as the basis of developing a new game that promotes healthy eating and nutrition. Currently the game is still in the development process, however once data is collected from the new games evaluation reports, data could arise that further lends support to the development methods chosen and that were adopted into the DeLHTA methodology.

8.4 Final Remarks

The research outlined in this thesis, documents the development methods, the IM, 4DF & MDA, that were chosen by the researcher to aid the PR:EPARe projects creation. The adoption and implementation of these methods were used to address the overall objective of the research, to develop a new methodology that combined intervention approaches, serious games and entertainment theories.

Using preliminary feedback and evaluation data that was gathered in the assessment phase of the PR:EPARe game, key areas were considered and recorded as to their impact on the games end users. As a result, a preliminary method, DeLHTA, arose from that data and the groundwork for further development of this method was laid. Both the DeLHTA methodology and the PR:EPARe game provided different challenges throughout the research cycle.

Developing the PR:EPARe game was a complex experience, one which required the help of many experts and users in order to achieve its objectives. Working alongside these experts has led to a greater understanding from the researcher, that to really develop an informed serious game then participatory design must take place. From this experience, further research into this area is planned to help further inform the DeLHTA methodology and progress work relationships between fields for future participatory needs.

Additionally, from the researchers view, the second section of the game could have been improved further following the feedback, if there had been an extension to development time. This could have gone some way to improving the data in the second evaluation study. However, the game did deliver some of its learning objectives and ultimately, students came forward concerned with coercion after interacting with the game. This point alone suggests that the game has shown some positive results as a learning and awareness tool, and as such, the researcher is pleased to have been part of this process. Since PR:EPARe is an ongoing project in terms of evaluation studies, the researcher intends to continue to be a part of this process and develop the game further.

Development of a new methodology that targeted several areas of research also proved to be a complex process as considerations for each area has to be addressed. Due to the time constraints of the project, the DeLHTA methodology was developed alongside the PR:EPARe game. This meant there was no time to reflect at each stage of the process the pros and cons of each method. However, what this research does provide is a look into combining intervention approaches, serious games and entertainment games techniques, and pinpoints issues in this process. It also achieves the objective with delivering the DeLHTA methodology and highlights the aims of delving further into practitioner based user design and participatory design, two areas often overlooked in serious games.

This research presents the DeLHTA methodology as a preliminary study towards future work in developing specialised serious game frameworks and methods for design and development purposes. With further evaluation, the researchers hope is that the DeLHTA methodology can and will be used in future projects that concern serious

games and e-learning and will provide some advances in the research of serious games design.

On a final note, the research shown in this thesis has not only highlighted a new practise for future evaluation, but has opened up areas concerned with development strategies that were previously unknown or were not considered significant to the researcher. This has led to further inquiry from the researcher about the traditional approaches that are usually adopted and implemented in development cycles for serious games. Ultimately, this has led the researcher to consider alternative methods such as the needs analysis, to play an important role in future serious games work and has inspired the researcher to change factors in her design and development style for serious games.

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10 Appendix

10.1 Appendix A - Game Concept Document

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ARC HLI

5/17/2011

Game title

PR:EPARe: (**P**ositive **R**elationships: **E**liminating coercion and **P**ressure in **A**dolescent **R**elationships)

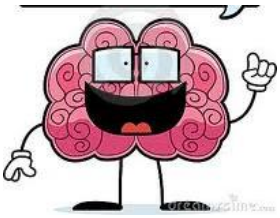
PART 1 – Introduction and identifying coercion

Host characters:

Male and female characters appear on screen and introduce the game. Young people have fed in and said that these should be cartoon-like and not too human looking. Steering group agreed that cartoon like images will help make the serious game look like a game and not a documentary.

Potential hosts:

Image of host characters	More info

	The tiles could exist on a ‘wheel of fortune’ with a game show host.
	The host could be a large head with a small body and act as the comic relief to a serious situation.
 	The hosts could be a ‘brain’ and a ‘heart’ to represent thinking with your brain and thinking with your heart? Sometimes you can ignore your own better judgment and go with your heart?
	Use more anime style teenagers

Young people have a strong preference that the host characters have voices. This will make the game easier to follow and maintain a pace within the class. It will also compensate for any students who have difficulties reading. The teacher should select names to be used in the game (other than host characters who have old fashioned names) from a set of options. Could the game randomly then use these as it plays? This helps avoid using same names as students in the class and associated teasing and disruption.

Female character Norma Host: *Hi! My name's Norma and this is Norman. In this game you get to choose different options and see what happens…!*

Male character Norman Host: *….yes, the game is about putting pressure on people to do things they may not want to do, or feeling under pressure, in relationships. This can be called coercion. When people like you were asked, they said that pressure in relationships, including feeling under pressure to have sex or do other things they didn't want to do was something they were concerned about. They wanted RSE, or relationships and sex education, to look at and explore this issue.*

Click to continue button takes player to…

Female character: *Experiencing pressure in relationships is very common and can happen to girls and boys. You could find yourself in such a situation – sometimes you could be the one putting pressure on someone else, and sometimes it could be you being put under pressure. It's important to recognise when this* is happening. *In this part of the game you get to pick scenes or scenarios, discuss them if you want to, and decide whether you think they are situations where coercion or pressure is happening – remember you are under a time limit here, so you need to stay focused and make your decision before the time is up!*

These scenarios should appear on screen as a selection of tiles or tabs that can be clicked on and can be selected in any order. They should appear in a random order on the page and **not** be a linear progression from no coercion to very high coercion.

When each tab is clicked on it takes players to a new screen where there is a brief description of a potentially coercive scenario described (includes illustrative picture). The teacher or game facilitator can read this aloud (or should ideally be game audio) to the students/players and they can spend time discussing as a whole group or in smaller groups.

They should then make a decision about whether or not someone in the scenario is being coerced or pressured to do something they don't want to do

There should be an inbuilt timer that can perhaps be set by the facilitator (within limits) to limit the amount of time that young people take in coming up with an answer – they could have a kind of countdown and alarm to let them know about this.

Potential timers:

Tile 1:

'Sexting snaps' or '4pl@y'

(PJ alternative suggestion: *Pete and Aneeta have been seeing each other for about 6 weeks. Things are going well, and they are both quite happy not to have started having sex with each other, but Pete has sent a bbm last night that Aneeta felt uncomfortable with. Pete messaged asking 'what colour knickers are you wearing?' Aneeta replied but then Pete just messaged 'prove it – send a picture.. :p'. Is this an example of coercion?*

Timer goes on – (3 minutes).

There should be an option to say YES or NO or MAYBE to this question. Whichever answer is pressed here the feedback response is – *'You could be right!'*

FEEDBACK:

The first thing to note is that if you are aged under 18 years old it is illegal to send a sexually explicit picture of yourself or receive a picture like this of someone who is under 18 years old. You can be arrested, charged and serve time in prison for this kind of offence.

Even for people over 18 years old, this is a difficult situation. It depends on the two people involved, how well they know each other and how comfortable they feel with one another. After 6 weeks, they may not know each other all that well! If Aneeta did send a picture, think how quickly that picture could be spread around. Think of all the people who might see it! How would she feel if other school mates saw it, teachers, parents…..?

In this particular scenario, Aneeta feels uncomfortable with the idea. If she said yes and did this when she felt unhappy about it, then she would be feeling pressure to do something she did not want to do.

What do you think is the best response Aneeta could make? What should Pete do?

Opportunity for the teacher or facilitator to gear discussion to the idea that Anita should say 'no' because she does not feel comfortable or happy about it

Pete should respect her decision to say no.

Include more about open communication between the couple.

Include what peers think is not as important as the other person in the relationships feelings.

Extra information:

We could present the conversation that Pete and Aneeta have on bbm in an actual 'bbm message' then have some of the key messages laid out like this e.g. (enlarge picture to read text).

For an extension activity:

Create your own campaign to prevent texting: e.g.

Tile 2:

Just getting off:

Marvin and Tom have been out a couple of times. Last time they met up, they kissed, and Marvin tried to take things a bit further, but Tom said he wasn't ready to go any further yet. On their third date, Marvin tries to take things further again, but Tom still doesn't feel ready for that. Is this an example of coercion?

Timer goes on – (3 minutes)

There should be an option to say YES or NO to the question. If they say NO it is Incorrect and if they say YES it is Correct and in both cases followed by feedback information below.

FEEDBACK:

Because this is the second time Marvin has done this, this is starting to become coercive, because Marvin knows that Tom did not feel ready quite recently and he's applying pressure by trying to take things further again. How should Tom respond? What should Marvin do?

Really need to encourage conversation and open communication.

The class could discuss reasons for why Tom is not ready.

Must reinforce that only you can decide what is acceptable for you and what is not.

Opportunity for the teacher or facilitator to guide discussion to the idea that Tom can continue to say no, and that Marvin should respect Tom's wishes, and wait for Tom to suggest going further. If Marvin continues to put pressure on Tom when he's not ready, Tom should consider whether this is a good relationship.

Extra info:

The extension activity could be 'what other myths/stereotypes about relationships can you think off (along with the third date rule). Something like the guy should pay for everyone – does this mean the girl owes him something? Wearing tight clothes – does that mean you can be treated in a sexual way?

Extension activity:

The class could put on a mini play where they act out communication skill in this scenario.

Tile 3

Stay out late

Jo, Amber, Tariq, Jordan and Aneeta have been hanging out together on Friday night. Jo has to be home by 10.30pm or her dad gets really worried. All her mates know this, but start saying that it's lame to go home that early and try to persuade her to stay out when she says she's heading off home. They do this quite a lot. They are all your age. Is this an example of coercion?

Timer on – (3 minutes)

There should be an option to say YES or NO to the question. If they say NO it is Incorrect and if they say YES it is Correct and followed by feedback information below.

FEEDBACK:

Even friends can be coercive and put pressure on one another to do things they don't want to do, or know they shouldn't do. Coercion isn't just about relationship or about sex. What's the best way for Jo to respond? What should her friends do?

Opportunity for the teacher or facilitator to get discussion going, and point out the positive consequences of Jo making sure she gets home on time and resisting pressure to stay out (e.g. she will show her step dad that she is responsible and can be trusted to do what she agreed to do, which might in the future lead to her being allowed to stay out later to do other things which he restricted before). Could also look at h*ow can Jo communicate with her dad about this?*

Should she negotiate with her friends about how long she can stay out?

Need to state the negative consequences of not going home so they outweigh the positives of staying with the friends.

Could look at the nature of real friendships and how real friends would not pressure you.

Tile 4:

Touchy feely

Nabila and Holly have liked each other for a while but have been shy about admitting it, in case the other didn't feel the same way. Nabila is older than Holly and she has had more sexual experience. One night at the school disco Nabila suggests getting away from everyone and going into one of the empty classrooms. Holly is excited and wants to be alone with Nabila and agrees happily. Once they're alone though Nabila wants to do things that Holly feels uncomfortable about. Holly tells Nabila that that is going too far at the moment, but Nabila continues trying to go further. Holly very firmly says no that she's not ready. Nabila realizes that Holly really isn't happy, and stops. Is this an example of coercion?

Timer on – (3 minutes)

There should be an option to say YES or NO to the question. If they say NO it is Incorrect and if they say YES it is Correct and followed by feedback information below.

FEEDBACK:

Nabila was being coercive and putting pressure on Holly when Holly said no and Nabila continued anyway, BUT she did realize what she was doing and stopped. It is good that she stopped, but it would have been better to stop when Holly said no the first time. What do you think about what happened here? Did Holly do anything wrong?

Opportunity for the teacher/facilitator to focus discussion on idea that Holly did what she was happy with, and simply said when she was no longer happy. Draw out idea that people's experience and what they feel happy about can differ, and that that's ok – it's good to go with what both people are happy with (e.g. both like kissing – so good to stay with kissing etc).

Also

It is important to think about what you feel happy and comfortable doing in this kind of situation BEFORE you get into this kind of situation. Be aware that if someone wants to be alone with you they may want more than you do.

If you're the person who wants more than the person you're with, STOP, and think about how they feel and how good it is to respect what the other person wants.

Might mention how alcohol and drugs can influence judgment at disco's/parties.

Age of consent needs to be addressed as Nabila is older.

They might not want to kiss in public.

You are allowed to say no at any point of time. Even if Holly said yes to being alone with Nabila, she can change her mind at any time. It is not being a tease.

Extension activity:

Have the class come up with phrases on how to say no and the other half have to keep pushing it like a debate - then they swap over to understand both roles.

Tile 5:

Getting ribbed

Chris doesn't have a girlfriend but has kissed one girl. His mates have been on at him to snog a girl in his class. Chris thinks she's all right but he's quite shy and not really bothered about getting off with her. He'd rather just leave it but his mates won't give up on it, so he's thinking about kissing her after the school football match on Monday. Is this an example of coercion?

Time on – (3 minutes)

There should be an option to say YES or NO to the question. If they say NO it is Incorrect and if they say YES it is Correct and followed by feedback information below.

FEEDBACK:

Chris is being put under pressure by his mates to do something he doesn't really want to do and so he is being coerced by them. What do you think Chris should do? What might be the best way to deal with this?

Opportunity for the teacher/facilitator to focus on ways to manage escalating or continued requests to do something and to talk about respecting other peoples' wishes when they say no to something like this.

They should discuss the rights of the girl involved here. Is it fair on her to try to get together with her if Chris isn't really that bothered about it?

What does he really want? To get his friends to back off -communicate with her?

Why are his friends pushing him? Do they understand what they are doing?

Tile 6:

All the way?

Alex and Ayesha have been seeing each other for a few months. Recently Ayesha's friends have been talking a lot about having sex, and one of them, Alice, says that she's done it with her boyfriend. Ayesha keeps suggesting to Alex that they should start trying stuff too. She wants Alex to go down on her (give her oral sex). Alex keeps saying that he thinks they should wait, he thinks things are fine as they are, but Ayesha says she wants more. Is this an example of coercion?

Timer on – (3 minutes)

There should be an option to say YES or NO to the question. If they say NO it is Incorrect and if they say YES it is Correct and followed by feedback information below.

FEEDBACK:

This is an example of continued pressure being placed on one person by another, in this case, Ayehsa is putting pressure on Alex, and this is likely to cause problems. What should Ayesha and Alex do? Is there another example of pressure in this scenario?

Opportunity for teacher/facilitator to get class/players to start to think about negotiation skills and options for finding a solution. Perhaps lead discussion towards getting them to think about broader pressure Ayesha may feel under and how that might affect her putting pressure on Alex.

Talk more about negative consequences, again rumors could start. Does he really trust her? Is this the best relationship for them both?

Talk about how first time for any sexual act should be with someone you trust and love.

No direct peer pressure but it is the way Ayesha is interpreting it.

PART 2 – avoiding coercion and decision-making

The player (class of students) is an unseen character – so we're viewing the world through their eyes as we play. Gender of 'other' should be selected randomly by the game and this should be demonstrated by a dice throw on screen/ press a big button or

similar. The teacher/facilitator should be able to retain the selected names again to make them appropriate for group they are working with.

Male character comes on screen to introduce this section.

Male character 'Norman': Hi – me again! In this part of the game you get to play yourself in two different scenarios. First of all you see one version of events play out, then time rewinds and you get to change any outcomes you didn't like by making different choices at certain moments. If you're playing as a group, then you can discuss what you think the best option might be, and why, and take a majority vote….and then see what happens!

Scenario 1 (coercion where 'other' is the perpetrator)

Norman introduces 'x'. S/he is called 'x' and you think s/he is totally gorgeous. S/he has loads of friends and is well-liked by people you know. You thought s/he would never be interested in you, but yesterday s/he asked you to chill after school tomorrow, and you're really excited about it…

…It's the day you're going to spend time with 'x'. You've walked around school together for a while, everyone else has gone home. You've had a great time so far talking and joking around. You start walking home but no one is around because 'x' is taking the back way that you don't usually take.

X: '*This has been fun, hope you've enjoyed it as much as I have…'*

Players click to respond:

Y*eah, it was cool…we should do it again*

Yep, I had a really nice time….thanks! Shame we have to go home now.

Yeah it was… do you always walk home this way?

X: '*Yeah awesome … I always walk this way it's much quieter ain't it, come down here a second'* (*X holds your hand* and *is pointing towards a bench behind the old youth centre building)*

Players click to view text of own internal voice:

What is x on about… I don't see what's wrong with carrying on walking … we've only chatted properly for the first time today… maybe s/he wants to get up to stuff? I'd quite like to kiss her/him but I'm not really ready for things to go any further…especially not here on this bench!

Coercive scenario plays out as follows:

You follow x into the dark concealed corner
x turns around and starts to kiss you, *Players click to hear own internal voice: mmm ok this is nice, oh and that's nice too, mmm, but oh ok I'm not so sure about that…I don't like that actually* You let x carry on even though you don't like it…and it doesn't go very well

Cuts to next day:
YOU: You're feeling miserable because you let x carry on even though you didn't want him/her to and it didn't go very well because you weren't really into it – it was all a bit awkward and now you think x is probably put off.

X:

X is also feeling miserable because the date had gone really well until they'd started getting off with you, there was a point where it just didn't feel quite right anymore and they feel like maybe they pushed it too much and have put you right off the idea of the two of you.

Game depicts re-wind in time to end of the date scenario again and this time players get to change things by taking action at certain points…

X: 'This has been fun, hope you've enjoyed it as much as I have…'

Players click to respond:

Y*eah, it was cool…we should do it again*

Yep, I had a really nice time….thanks! Shame we have to go home now.

Yeah it was… do you always walk home this way?

X: '*Yeah awesome … I always walk this way it's much quieter ain't it, come down here a second'* (*X and holds your hand is pointing towards a bench behind the old youth centre building)*

Players click to view text of own internal voice:

What is x on about… I don't see what's wrong with carrying on walking … we've only chatted properly for the first time today… maybe s/he wants to get up to stuff? I'd quite like to kiss her/him but I'm not really ready for things to go any further…especially not here on this bench!

Players must decide what to do next:

say, 'it's getting late, we should get home…'

suggest heading on as you're hungry and want your dinner

lean in for a kiss briefly and then take his/her hand and keep walking

Scenario continues….
X says: OK cool… You walk on down the street a bit further X turns round as you approach a bus shelter and starts kissing you *Players click to hear own internal voice: mmm ok this is nice, oh and that's nice too, mmm, but oh ok I'm not so sure about that…ahh that's going a bit far…*
Scenario pauses
Male host character cuts in and says: There's loads of ways you can deal with this and have it all turn out ok – you could say something like, 'mmm I really like you but let's not go too quickly' or use your hands to gently stop something you don't like and say, 'I don't want to do that now.' Why not discuss between you what sorts of things might work or be good to say –

what would feel normal or natural for you?

Class could discuss in smaller groups and put suggestions forward to the class as a whole and then together they vote on favored one from the selection.

Teacher/facilitator needs to support discussion to a decision about what to say and then when press play to re-start, game prompts typing in of response chosen by group.

X: Ok - no worries….we can take things slower…however you want to play it….I just like being with you…

Cuts to next day:

YOU:

You're feeling good because you didn't let x carry on and you didn't end up doing something you didn't want to do…you're really excited about your next date.

X:

X is feeling really happy and excited too…s/he had a great time last night….s/he is really looking forward to seeing you again.

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Scenario 2 (coercion where ‘other’ is the victim and players are the perpetrator)

The player is an unseen character – so we’re viewing the world through their eyes as we play. Gender of ‘other’ should be selected randomly by the game and this should be demonstrated by a dice throw on screen or similar. The teacher/facilitator should be able to select names again to make them appropriate for group they are working with.

Female character ‘Norma’: Hi ok, well done for working through that scene. We want to make sure you are prepared for all types of situations and although many situations won’t have negative consequences some can make you feel bad if you do not know how to handle them. Everyone is at risk of being put under pressure to do something they do not want to do and everyone deserves to have their wishes respected. Ok! Let’s go on to our second scene. Just like before, you are playing

yourself. First of all you see one version of events play out, then time rewinds and you get to change any outcomes you didn’t like by making different choices at certain moments. If you’re playing as a group, then you can discuss what you think the best option might be and why and take a majority vote….and then see what happens!

Scenario 2 (coercion where ‘other’ is the victim)

Norma introduces a number of characters as ‘you’re friends’ i.e. the player’s friends**. Norma** says ‘you and a group of your friends are on a school camping trip, you are staying in tents and girls and boys have been strictly instructed by teachers to not enter each other’s tents. There has been a social event tonight in the local town restaurant. You are on your way back to the camp site…

We see a scene play out where ‘the player’ is being pressured by friends (mixed gender group) to have sex with ‘other’ on the school trip (we can’t see other at the moment).

Friend A – ‘go on you know you fancy her/him!’

Friend B –‘s/he was looking at you all day - s/he’s got amazing eyes – you should definitely end up in her/his tent tonight!

The player says: ‘oi! Hahaha you know I do fancy her/him but we only hung out once before and as if I’d get away with that round here!’

Friend A – ‘but this is the one time you get to be alone! Without parents and stuff!’

Friend B – You should definitely make the most of the opportunity!

The player says: – Yeah! Maybe! Whatever! I’m going to pee! See you later….

(Cuts to ‘you – the player’ finding ‘other’ alone on your way back from toilet block)

Player ‘you’ says: Hey you! I’ve been waiting to get to speak to you all day…how’s it going?

Other: Yeah….good thanks, how’re you?

Characters are depicted trying to awkwardly get past each other on a narrow pathway.

Player is depicted thinking: Ooh maybe now’s my chance

The player goes in for a kiss and embraces ‘other’ fully in the process. Other responds fairly willingly.

Player ‘you’ says: Shall we go somewhere more comfortable…?

Other: Errr….maybe…but shouldn’t we get back

Player ‘you’ says: C’mon…it’ll be fine

Other: I like you but….but I don’t really want to do this now…I think we should go back…I’m just not ready yet.

Player ‘you’ says: …it’s fine come on…I really like you…if you like me too, you would…

(Cut to shadowed figures in tent seen from outside so it’s clear that something has gone on between characters)

(Cuts to next day and depiction of the negative consequences such as both feeling **miserable** and possible **negative social consequences**?)

'You': (see internal thought depicted) s/*he looked so weird this morning at breakfast… s/he looks really upset… I feel a bit crap too… I wish I never pushed the issue of going back to the tent last night... I got a fb message last night askin' where had we disappeared to… dammit everyone knows and s/he is upset…*

'other': (depicted looking miserable) *I feel so embarrassed, what if everyone knows, I just wasn't ready and now it's too late, I can't even look her/him in the eye… gutted… why is everyone looking at me… do they know?*

(Game then depicts **re-wind** to beginning of events and players have the option to change things again)

Scene plays again:

We see a scene play out where 'the player' is being pressured by friends (mixed gender group) to have sex with 'other' on the school trip (we can't see other at the moment).

Friend A – 'go on you know you fancy her/him!'

Friend B –'s/he was looking at you all day - s/he's got amazing eyes – you should definitely end up in her/his tent tonight!

The player says: 'oi! Hahaha you know I do fancy her/him but we only hung out once before and as if I'd get away with that round here!'

Friend A – 'but this is the one time you get to be alone! Without parents and stuff!'

Friend B – You should definitely make the most of the opportunity!

The player says: – Yeah! Maybe! Whatever! I'm going to pee! See you later….

(Cuts to 'you – the player' finding 'other' alone on your way back from toilet block)

Player 'you' says: Hey you! I've been waiting to get to speak to you all day…how's it going?

Other: Yeah….good thanks, how're you?

Characters are depicted trying to awkwardly get past each other on a narrow pathway.

Player is depicted thinking: Ooh maybe now's my chance

The player goes in for a kiss and embraces 'other' fully in the process. Other responds fairly willingly.

Player 'you' says: Shall we go somewhere more comfortable…?

Other: Errr….maybe…but shouldn't we get back

Player 'you' says: C'mon…it'll be fine

Other: I like you but….but I don't really want to do this now…I think we should go back…I'm just not ready yet.

GAME PAUSES – Ok – so 'other' is making it clear that they like you but they are not ready to take things further right here and right now. What is better way for you to respond here? If you want to spend time together, how can you make that happen without anyone feeling pressured or upset about it?

Teacher/facilitator action: The group should be encouraged to discuss (perhaps in smaller groups) what might be a better course of action. Smaller groups could come up with suggestions which are noted down by teacher for people to see and the class could vote on which one to opt for. (This allows them to see that their peers support the idea of responding in this way to a clear 'no' when pressure has been applied).

There's also the possibility of getting discussion going around how to respond appropriately to friends who may be putting pressure on around having sex.

GAMEPLAY restarted by teacher/facilitator – the teacher can type in the response that the group has decided upon

(Cuts to next day and depiction of the positive consequences such as both feeling **happy**!)

'You': I can't wait to hang out with 'other' again. I'm glad I didn't push it with the going off somewhere more comfortable thing….this school trip has been immense!! So

many great memories, and now 'other' and I are seeing each other next week – great! Can't wait!

'Other': *I think 'you' wanted to go further last night but I wasn't ready, it was really nice of them to actually listen to me, it was respectful and I don't think a lot of people do that nowadays but it was cool, can't wait to see him/her again next week, what a great trip! Now to just get my mates to shut up about it!!*

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Finale section

Norma and Norman return to the screen to deliver messages about finding support and someone to talk to about experience of pressure in relationships.

Norma: We hope that the PREPARE game was interesting…if thinking about the issue of pressure and coercion in relationships has made you think that you would like some more help and support, or you just want to talk things through with someone or get more information…Norman and I think that's a really good idea!

Norman: Yes there are places where you can get more information or support, and there's information that comes with this game that will be emailed or given to you in paper format for you to follow up in your own time. Here's some possible sources of help and information though which are included in the information that will be given to you.

www.safelinewarwick.co.uk

Phone: 0808 800 5005

www.childline.org.uk

Phone: Tel: 0800 1111 (free phone)

www.truthaboutrape.co.uk

www.nspcc.org.uk

Phone: Tel: 0800 800 500 (free phone)

Norman: If you are concerned about feeling pressure in a relationship, you should also think about someone you *know* who you can talk to. This might be an adult you trust

and could be a parent or guardian or other family member. Or it might be a teacher or youth worker…think now about who you can talk to if you need to about feeling under pressure in a relationship.

Norma: Remember that if you feel uncomfortable or unhappy about something that someone wants you to do, OR if someone tells you 'no' or asks you to stop doing something, this could be an example of coercion. You could be the one who feels under pressure or you could be making someone else feel pressure. You CAN say something, and you are able to do things differently

Extra considerations:

Can email students with follow up information and link to the game online

Can put information in the students planners

Need to consider confidentiality issues for the teachers and such a topic could raise some personal information – how can the teacher deal with this appropriately

Teacher training is key

Try and balance light hearted elements with the more serious side

10.2 Appendix B - Game content planning from first three steering group meetings/Needs analysis

Comments/suggestions made re: content	**Steering group meeting**		
	Professionals 1	**Professionals 2**	**Young people 1**
Game should be geared at Y8/Y9 or those aged 13/14 years	✓	✓	
Game must fit with current RSE core package content	✓	✓	
Game needs to go beyond information giving and build skills	✓		
It would be good to include self-esteem and confidence building	✓		✓
It would be good to include negotiating early stages of a relationship and relationship building	✓		✓
Young people don't tend to talk to parents enough and need skills to start discussions with parents and other trusted adults about relationships and sex	✓		
There's a need to look at perceived norms in young people – make sure they don't make assumptions about what others are doing sexually that aren't true - myth busting	✓		

Promoting delaying sex or abstaining as a viable possibility	✓		
Need to look at the pressure young people are under to have sex and issues of abuse and coercion	✓	✓	✓
Need to help young people recognise blackmail and coercion when it happens and build confidence and skills to respond in the best way	✓	✓	✓
Need to encourage males to talk about their emotions and how they feel, rather than a pure focus on women getting pregnant and STIs.	✓		
Need to explore risk perceptions of young people and challenge faulty risk perceptions e.g. need to associate having sex with getting pregnant		✓	
Young people realise too late (after left school) that they've made some wrong choices and a game could be used to help them establish the link between choices and life outcomes		✓	
Learning about friendships as well as sexual relationships would be useful			✓

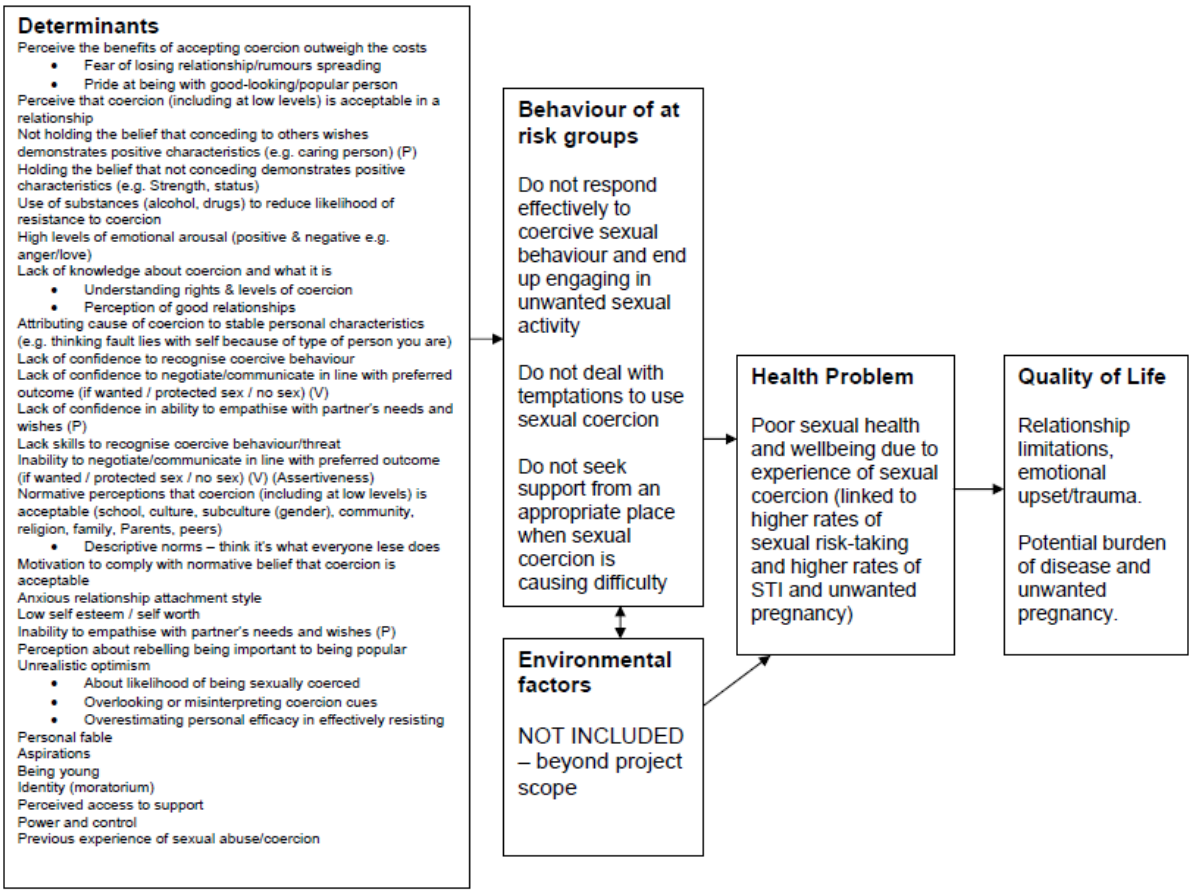
10.3 Appendix C – Summary of feedback concerning game content from the first three steering group meetings

Comments	Steering group1	Steering group 2	Steering group 3	Steering group 4
Needs to look grown up and as sophisticated from computer game playing perspective, as possible	x			
The Sims was mentioned in group 1 – take role of character and make choices about dealing with different situations	x	x see 'sliding doors' below	x	x
Would be good if played on-line with other young people so can see choices others make and their outcomes – addresses myths about what others do perhaps?	x	x		
Facebook as place to play it	x		x	x
The milk game as a computer game? Demonstrates spread of STI through starch in milk	x			
Element of competition – improve scores or beat others – decision-making game could give good decisions higher scores.	x			
Practical issues – computer technology available in schools? Schools being able to access things with word 'sex' in title etc	x	x		

Screens that flash huge words to get people's attention		x		
Needs to be fun to play – Super Mario mentioned and the idea of developing skills and getting better to progress		x		x
Film 'Sliding doors' mentioned in group 2 and the idea of playing out two different scenarios – game should let players try out different choices	x see 'sims' above	x	x	x
Practical issues to do with a whole class playing together need to be addressed		x		
Might access game outside of school if thought it was good and would rather do this than be told to play it by a teacher			x	
They thought having a person tell a story and then you answer about what you would do, would be good, wanted the game to help them deal with emotions as well as actions and they wanted different responses to choose from.				x
Girls play male version and boys play female version to understand others' perspectives				x
				x

Liked idea of having a discussion forum that they could ask questions via and get answers back by private message.				
They wanted characters that were cool but not stereotypes just normal kids not trying too hard to represent everyone.				x
They thought stopping and starting the game so having sections should be good – they don't want to be forced to play the whole thing through.				x
Facebook and texting and email should be incorporated!				x

10.4 Appendix D – Logic Model of Determinant Behaviour



10.5 Appendix E – Matrices of change objectives for RSE game

Performance objectives	**Attitude**	**Knowledge**	**Self-efficacy / skill**	**Subjective norm**	**Optimistic bias**
1.Respond effectively to coercive sexual behaviour to achieve outcome in line with own preferences	Expect there to be negative consequences of allowing unwanted sexual advances to continue	Identify nature and levels of sexual coercion	Express confidence in ability to recognise all types of sexual coercion	Explain that peers and older others recognise and respond effectively to coercion to avoid it	Understand the risk of sexual coercion and need to respond as personally relevant
1a. Identify discomfort with sexual request or behaviour	Identify low level coercion as negative	Label low levels of coercion as coercion	Express confidence in identifying low level coercion	State that peers and older others feel uncomfortable with coercive sexual requests and behaviour	
1b. Say no or clearly indicate discomfort with request or behaviour	Evaluate saying no to low level coercion as positive	Identify saying no as a possible response	Demonstrate confidence in saying no to low level coercion	Explain that peers and older others say no when they experience discomfort with a request or behaviour	
1c. Identify any further manipulative responses/requests to a clear “no” or indication of discomfort	Identify persistence with coercion as particularly negative	Recognise how coercion levels may increase	Express confidence in ability to identify continued or increased coercion		
1d. State adamance about not wanting to go along with request or behaviour,	Evaluate persistence with a negative response as positive	Identifying continuing to say no as possible	Demonstrate confidence in saying no in the face of resistance to earlier negative responses.	State that peers and older others persist with making their negative response clear	

Performance objectives	Attitude	Knowledge	Self-efficacy / skill	Subjective norm	Optimistic bias
whatever tactic is used					
1.Deal with temptations to use sexual coercion	Express the belief that coercive sexual behaviour has negative consequences for those that coerce others and those who are coerced	Identify nature and levels of sexual coercion			Recognise that anyone can potentially exert coercion on someone else, and see it as personally relevant
2a. Recognise own desires for sexual activity might be incongruent with others	Assess a partner's desire not to do something as a positive.	State that a simple incongruence in sexual arousal could lead to coercion.	Express confidence to recognise incongruence in desire to progress or engage in certain behaviours between self and partner	Appraise peers and older others as experiencing incongruence in desire during sexual activity	
2b. Stop making a request or performing a behaviour when a negative response is received	Evaluate stopping in response to a no response or aversive action as positive	Identifying stopping as an option	Express confidence in ability to stop		
1.Seek support from an appropriate place when sexual coercion is causing difficulty	Describe seeking support in relation to sexual coercion as positive.	Identify nature and levels of sexual coercion			

Performance objectives	Attitude	Knowledge	Self-efficacy / skill	Subjective norm	Optimistic bias
3a. Identify an organisation, trusted adult or friend with whom to discuss concerning or repetitive coercive behaviours or requests		List organisations, known and trusted adults and friends who could offer support and advice about experience of coercive behaviour		State that peers and others seek advice about coercion if it becomes a difficulty.	
3b. Discuss and decide on appropriate action	Value the opportunity to get assistance on this issue highly.		Express confidence in ability to discuss experience of coercion with identified appropriate source of support.		

10.6 Appendix F – Methods Selection

Determinant: Knowledge		
Change objectives	**Methods**	**Application**
Identify nature and levels of sexual coercion	Advance organisers: Overview of materials that enables a learner to activate a schema and relate new material to that schema Discussion: Encouraging consideration of a topic in open informal debate Participation: Assuring high level engagement of the players in problem-solving, decision-making, and change activities – control by the players	In **part 1** host characters present an overview explanation of coercion and players are engaged in making choices about which scenarios to discuss and are in control of decision-making and generating problem-solving ideas that are relevant to them
Label low levels of coercion as coercion	Participation Feedback: Giving information regarding the extent to which players have achieved learning	In **part 1** through decisions reached through group discussion, the game provides feedback about their response and the coercion being depicted.
Identify saying no as a possible response	Providing cues: Assuring that the same cues are present at the time of learning and the time of retrieval	In **part 1** and **part 2** various scenarios are depicted. It is impossible to know what players might face in their own lives but linking the idea of saying no across various scenarios (many suggested by young people themselves) attempts to achieve this.
Recognise how coercion levels may increase	Providing cues	**Part 1** includes scenarios with lower and higher level coercion and depicts increasing coercion within scenarios too, to support recognition of this.
Identifying continuing to say no as possible	Participation, Discussion and Feedback	In **part 1** players can identify saying no as a possibility and are supported in this through feedback
Identify ways to negotiate	Participation, Discussion and Feedback	In parts 1 and 2 engagement in the game and opportunities for discussion allow them to identify ways to negotiate. In **part 2** they see how their negotiation can lead to a more positive outcome.
State that a simple incongruence in sexual arousal could lead to coercion.	Participation, Discussion and Feedback	In **part 1** discussion around this issue is encouraged particularly around scenario 4 where one person is more sexually experienced than

		the other.
Identifying stopping as an option	Participation, Discussion and Feedback	In **part 1** the idea of stopping when someone says no should come through group discussion and feedback across all scenarios.
List organisations, known and trusted adults and friends who could offer support and advice about experience of coercive behaviour	Advance organisers	In the **Finale** section at the end and in follow-de-brief information, players are given contacts and reminded about talking to someone they trust.
Determinant: Attitude		
Change objectives	**Methods**	**Application**
Expect there to be negative consequences of allowing unwanted sexual advances to continue	Belief selection: using messages to strengthen positive beliefs, weaken negative beliefs & introduce new beliefs. Anticipated regret: Stimulating people to focus on their feelings *after* unintended risky behaviour, before any losses materialise Modelling: Providing an appropriate model being reinforced for the desired action.	In **part 2** (both scenarios), the game attempts to create/reinforce the belief that allowing yourself to be coerced will lead to negative emotional feelings
Identify low level coercion as negative	Belief selection, anticipated regret, modelling	In **parts 1 and 2**, across all scenarios there is an attempt to generate acceptance that even low level coercion is a bad thing.
Evaluate saying no to low level coercion as positive	Active learning: Encouraging learning from goal-driven and activity-based experience. Belief selection, anticipated regret and modelling	In **part 2** through actively engaging with the game as 'themselves', and being set the goal of changing the negative outcome witnessed before, players should evaluate saying no as positive.
Identify persistence with coercion as particularly negative	Belief selection, anticipated regret and modelling	In **parts 1 and 2** some scenarios demonstrate persistence in putting pressure on someone. In **part 2** the negative consequences are specifically identified
Evaluate persistence with a negative response as positive	Belief selection, anticipated regret, active learning and modelling	In **part 2** through engaging and influencing outcomes themselves to get a positive outcome, players ought to view persistence in saying 'no' as positive
Identify assertiveness and engaging in negotiation around	Belief selection, anticipated regret, active learning and modelling	In **part 2** through engaging and generating ideas about how to respond to coercion, and seeing the

what is wanted as positive.		positive outcomes play out as a consequence; players ought to identify negotiation as positive.
Express the belief that coercive sexual behaviour has negative consequences for those that coerce others and those who are coerced.	Belief selection, anticipated regret, and modelling	In **part 2**, both scenarios demonstrate the negative consequences for both parties when coercive sexual behaviour has been allowed to progress.
Assess a partner's desire not to do something as a positive.	Belief selection, anticipated regret, active learning, modelling	In **part 2** positive reactions from modelled characters and positive consequences to players' responses around avoiding coercion will support an assessment that this is positive.
Evaluate stopping in response to a no response or aversive action as positive	Belief selection, anticipated regret, active learning and modelling	In **part 2** positive reactions from modelled characters and positive consequences to players' responses around avoiding coercion will support an assessment that this is positive.
Assess a partner making alternative less sexual suggestions as positive	Belief selection, anticipated regret, active learning and modelling	In **part 2** positive reactions from modelled characters and positive consequences to players' responses around avoiding coercion will support an assessment that this is positive.
Describe seeking support in relation to sexual coercion as positive.	Belief selection	In the **Finale** the host characters suggest that seeking support or further information is a good thing.
Highly value the opportunity to get assistance on this issue	Belief selection	In the **Finale** the host characters suggest that seeking support or further information is a good thing.
Determinant: Optimistic bias		
Change objectives	**Methods**	**Application**
Understand the risk of sexual coercion and the need to respond as personally relevant.	Consciousness raising: Providing information, feedback or confrontation about the causes, consequences and alternatives for a problem or a problem behaviour. Personalise risk: Providing information about personal costs or risks of action or inaction. Scenario-based risk info: Providing information that may aid the construction of an image of the ways in which future loss or accident might occur.	**Parts 1 and 2** draw directly on possible and likely scenarios to demonstrate personal risk and high likelihood of coercion arising for all. **Part 2** gives information about personal costs and emphasises advantages and disadvantages as appropriate.

	Framing: emphasise advantages of performing or disadvantages of not performing the behaviour.	
Recognise that anyone can potentially exert coercion on someone else, and see it as personally relevant.	Consciousness raising, Personalise risk, scenario-based risk info and framing	Scenarios across **parts 1 and 2** are designed to ensure both perspectives are made relevant. **Part 2** specifically puts players in perspective of the person doing the coercing.
Determinant: Self-efficacy		
Change objectives	**Methods**	**Application**
Express confidence in ability to recognise all types of sexual coercion	Guided practice: Prompting individuals to rehearse and repeat the behaviour various times, discuss the experience, and provide feedback. Enactive mastery experiences: Providing increasingly challenging tasks with feedback to serve as indicators of capability	In **part 1** players repeatedly identify coercion, discuss their ideas about why it is coercion and get feedback and some scenarios involve grey areas to make it more challenging.
Express confidence in identifying low level coercion	Guided practice and enactive mastery experiences	In **part 1** players repeatedly identify coercion, discuss their ideas about why it is coercion and get feedback, and some scenarios involve grey areas to make it more challenging.
Demonstrate confidence in saying no to low level coercion	Guided practice and enactive mastery experiences Verbal persuasion/exhortation: Using messages that suggest the participant possesses certain capabilities.	In **part 2** the game host tells players that they are able to find ways to deal with coercive situations and players are directed to come up with solutions and get positive responses to these.
Express confidence in ability to identify continued or increased coercion	Guided practice, enactive mastery experiences and verbal persuasion/exhortation,	Scenarios in **parts 1 and 2** include continued or increased coercion examples and participants are engaged in efficacy-enhancing activity as outlined above
Demonstrate confidence in saying no in the face of resistance to earlier negative responses.	Guided practice, enactive mastery experiences and verbal persuasion/exhortation	In **part 2** the game host tells players that they are able to find ways to deal with coercive situations including after resistance to an initial 'no' response and players are directed to come up with solutions and get positive responses to these.
Express confidence in ability to negotiate alternative actions	Guided practice and enactive mastery experiences	**Part 2** gives players the opportunity to try out alternative actions/suggestions and witness a

		positive outcome as a consequence
Express confidence to recognise incongruence in desire to progress or engage in certain behaviours between self and partner	Guided practice and enactive mastery experiences	**Part 2** gives the opportunity for players to recognise possible expressions of a partner not wanting to go as far as the player does, and think about how to respond positively. Player gets positive outcome from a good response.
Express confidence in ability to stop	Guided practice and enactive mastery experiences	In **part 2** players can see a demonstration of a game character stopping in scenario 1 and then play out stopping as themselves in scenario 2 and witness the positive outcomes of this.
Demonstrate confidence in asking a partner to suggest what they would prefer to do	Guided practice and enactive mastery experiences	**Part 2** scenario 2 in particular allows rehearsal and preparation for being able to do this
Determinant: Subjective norm		
Change objectives	**Methods**	**Application**
Explain that peers and older others recognise and respond effectively to coercion to avoid it	Information about others' approval: Providing information about what others think about the person's behaviour and whether others will approve or disapprove of any proposed behaviour. Resistance to social pressure: Stimulating building skills for resisting social pressure Stimulate communication to mobilize social support: Prompting communication about behaviour change to provide instrumental and emotional support. Provide opportunities for social comparison: Facilitating observation of non-expert others in order to evaluate one's own opinions and abilities	The game aims to indirectly bring about change in identified change objectives here. The scenarios are all about resisting pressure from one or more others and should therefore stimulate skill development to some extent. Because the game calls for group discussion and decision-making throughout, it is anticipated that where this works, players will be provided with information about others approval, feel social support relative to this issue, and be able to compare and learn from non-expert peers
State that peers and older others feel uncomfortable with sexual requests and behaviour when coercion is involved	Info about others' approval, resistance to social pressure, stimulate communication to mobilize social support and provide opportunities for social comparison	See above
Explain that peers and older others say no when they experience discomfort with a request or behaviour	Info about others' approval, resistance to social pressure, stimulate communication to mobilize social support and provide opportunities for social comparison	See above

State that peers and older others persist with making their negative response clear	Info about others' approval, resistance to social pressure, stimulate communication to mobilize social support and provide opportunities for social comparison	See above
Explain that peers and older others negotiate alternative outcomes.	Info about others' approval, resistance to social pressure, stimulate communication to mobilize social support and provide opportunities for social comparison	See above
Appraise peers and older others as experiencing incongruence in desire for sexual activity	Info about others' approval, resistance to social pressure, stimulate communication to mobilize social support and provide opportunities for social comparison	See above
State that peers and older others would ask partner to suggest an alternative	Info about others' approval, resistance to social pressure, stimulate communication to mobilize social support and provide opportunities for social comparison	See above
State that peers and others seek advice about coercion if it becomes a difficulty.	Info about others' approval, resistance to social pressure, stimulate communication to mobilize social support and provide opportunities for social comparison	See above

10.7 Appendix G – Example of Questionnaire used in the Evaluation

Strongly agree ☺	Agree	Neither agree nor disagree 😐	Disagree	Strongly disagree ☹

10.8 Appendix H - Ethics Review Feedback Form

1. Evaluation of the ethics of the proposal:

The project appears to involve two sets of people. One is the group detailed in the proposal as aged 18-65 male and female from mixed backgounds, and it is to them that the participant information sheet is directed. However, the participation information sheet refers to the participant delivering material in a classroom, and the project description also refers to work in schools under supervision and therefore not requiring a CRB check. at what stage and how is the consent of the scholl children obtained?

2. Evaluation of the participant information sheet and consent form:

As aabove, and what is the relevance of the reference to access of the information by US agencies?

3. Recommendation:

(Please indicate as appropriate and advise on any conditions. If there any conditions, the applicant will be required to resubmit his/her application and this will be sent to the same reviewer).

X	Approved - no conditions attached

	Approved with minor conditions (no need to re-submit)
	Conditional upon the following – please use additional sheets if necessary (please re-submit application)
	Rejected for the following reason(s) – please use other side if necessary
	Not required

(Review feedback should be completed within 10 working days)

Name of applicant: Samantha Clarke.....

Faculty/School/Department: [Engineering & Computing] EC Computing & The Digital Environment.....

Research project title: Practitioner centred user design - A framework for developing usability to help deliver sensitive subject matter

Comments by the reviewer

Name of reviewer: Anonymous

Date: 21/08/2012

10.9 Appendix I - Facilitator's Manual

Partners from Coventry PCT, Warwickshire PCT, Coventry City Council, Warwickshire County Council, the Applied Research Centre for Health and Lifestyle Interventions - Coventry University, and the Serious Games Institute contributed to the development of the PR:EPARe game. The game is designed to support the fantastic work Relationships and Sex Education (RSE) teachers do with young people. The PR:EPARe serious game and the PR:EPARe facilitators' manual offers you a unique educational resource for your students. You may have touched upon some of the ideas and messages that the game introduces previously; however we hope that by providing an interactive educational experience around the issue of pressure and sexual coercion within relationships we can support you in giving young students a high standard of RSE.

PR:EPARe is a computer based serious game for use with young people in sex education lessons. It deals with the subject of pressure and coercion in (mainly) sexual relationships. It has been developed with the help of health professionals, teachers and young people themselves. The game was developed using an approach called Intervention Mapping. The content draws on the evidence base about the factors related to experience of coercion in young people. It aims to improve knowledge and raise awareness of the likelihood of experiencing coercion, and promote positive attitudes about responding assertively to sexual coercion. Discussion with peers prompted by the game aims to enhance feelings of support about dealing with pressure and coercion, and thinking ahead about responses that might be appropriate in coercive situations aims to promote feelings of control over such situations.

The purpose of this manual is to support you in the delivery of the game. It provides an overview of the exercises in the game, the key messages and provides a number of interactive extension activities to consolidate the skills taught within the game. Also the computer based technology we have used to create this game is easy to navigate with the help of this manual.

We hope you find the resource useful, and are keen to hear any feedback that you may have so that we can improve the game in the future. Our contact details are provided at the end of this document.

Many thanks – the SASH team

PS – Words written in *italics* in the text appear in a glossary at the end of the document

PR:EPARe is a computer based *serious game* for young people. The game addresses the issue of pressure and *sexual coercion* within relationships. A number of professionals and young people have been involved at every step of developing the game and now it is your turn to be involved. You, the *facilitator*, will be delivering the lesson to a class of young people. This is an important role to play and this manual has been designed to provide support for you.

What will this manual teach me?

By the end of this manual you should:

- Understand the rationale behind the development of PR:EPARe
- Understand the aims and objectives of the game
- Become familiar with the exercises within the game and how to deliver them
- Be able to direct young people to the necessary supporting organisations if the need arises
- Choose from a range of extension activities to support your class' learning

The core objectives of the game are:

- Enable young people to understand what coercion is and that it may happen in different ways to and be performed by different people
- Enable young people to understand that they may be coerced
- Enable young people to understand that they may coerce other people
- Enable young people to recognize coercion
- Enable young people to foresee possible negative consequences for everyone involved in a coercive situation
- Enable young people to think about and plan how they might respond to coercion
- Enable young people to understand that they can act to stop a coercive situation escalating
- Enable young people to understand that they can stop themselves from coercing someone else
- Enable young people to understand that they can get help and support if they are worried about feeling under pressure, being coerced, or being coercive.

For this lesson you will require:

- A computer with internet access* or a copy of the game on a disc or downloaded in advance to the classroom computer
- Speakers for the computer
- Projection screen and projector
- Depending on which, if any, extension activities you choose you will require paper and pens for your class.

*You can access the PR:EPARe serious game live via the website where the game is hosted. You may need to contact the I.T. services department in your organisation to temporarily disable any software that may block access to the host website.

Be clear with the class about the goals of the PR:EPARe game. Cover the objectives; you could write them on the board so they are always clearly visible. At the end of the lesson you can refer back to them to consolidate learning. Choose from the list of core objectives provided above; and re-phrase to suit the literacy level of your group.

Introducing the game

Let the class know that although PR:EPARe is a game it is also a learning experience. The subject matter may be sensitive for some class members therefore it is vital to set ground rules before you begin. These may include but are not restricted to: respecting others opinions, keeping what is discussed in the class confidential and not stopping others from learning by being disruptive. The game is meant to be played as a class so listening to others and making decisions together is also very important. The game encourages debate, but how long this should last is up to you as the facilitator. The game also contains visual and audio segments to allow ease of understanding for your class. The audio has been recorded by some of the young people who helped develop the game.

Your class should perhaps be sat in pairs or small groups so that they have people with whom to discuss and decide about responses. If many small groups are involved, then you may need to pause the game to get an idea of the majority vote before proceeding!

Two characters, Bruce and Gwen, host the game. Press play and they will introduce the game, and tell the class what happens in part 1.

This manual provides guidelines for delivering the lesson but you as the facilitator know your class best. If you feel there is a particular word or concept they do not understand, you can **pause** the game at any time and discuss this with your class. Or, if they have come across a word or concept they are familiar with you could use this opportunity to consolidate learning. You may feel that a particular point made needs expanding or reiterating, and you can use the pause button so you can repeat or expand on the audio or check for understanding. Press pause again to resume play!

The game comes to a natural pause when Bruce and Gwen introduce the start of the first exercise. This is when the visuals move from the hosts, to the to the game show contestants who represent the answers YES, NO and MAYBE. You will see 6 buttons

appear on the screen which represent 6 different scenarios.

When you are ready, choose a scenario by clicking on it. It doesn't really matter which one you choose first. Some teachers like to start with the non-sexual **'Staying Out Late'** scenario first. Then '**Getting Ribbed'** is a good lead into more sexual issues because it is just about kissing, and about a boy being coerced by his mates to kiss a girl. **'Touch Feely'** and **'Just getting off'** both deal with same sex couples, so depending on how mature the group is, you may want to get them started with other scenarios and lead into these.

In each case, the screen zooms in on an illustrative image. The hosts will explain what the image represents – they will describe a scenario that potentially involves a person or people placing pressure on another person. When they have finished explaining the scenario the hosts ask the class if they think the scenario is an example of coercion and the class has a minute on the timer to discuss this between themselves and decide whether they think that YES it is an example of coercion, NO it isn't, or if they are not sure they can answer MAYBE.

The aim of this exercise is to get the class to think about the concept of coercion and how it can occur in day to day life. It also helps them to understand that coercion comes in different forms and different contexts. It might help to explain that the characters in each scenario involve people roughly the same age or slightly older than your class.

The timer encourages quick thinking and (roughly) simulates real life where you may not have long to decide something. If you have a large class it may be more practical to divide them into groups for the purpose of this lesson. You can then get a majority vote either by each group or from individual hand-raising – or see extra tip below for more ideas.

If your class needs longer than a minute then that is fine. When your class has decided on their answer YES, NO or MAYBE, you can click the corresponding contestant to input their answer. Some teachers have also asked their class to JUSTIFY their answer and explain WHY they think it is or is not, or might be coercive – this helps to prompt discussion and is a good idea!

When you click on the podium buzzer corresponding with the selected answer, the game will respond by letting you and the class know if they are correct or not and the hosts will provide some brief verbal feedback.

Feedback: Some feedback to the answer will be provided briefly by either Bruce of Gwen. When the initial feedback is delivered, this is an excellent opportunity to pause the game and discuss with the group in further detail what the likely and possible outcomes of the scenario are and how it might be best to respond to them for someone in such a situation. We provide some specific suggestions alongside screen shots from the game to aid you with this, below.

Extra tip for deciding on answers with your class: If you would like to introduce more interactive activity to your class then use the 'line game' for this exercise. Use duck-tape (or whatever works) to draw a line down the middle of the classroom. The right side is coercive (yes – in the game), the left side is not coercive (no - in the game) and standing on the line is 'maybe'. Once the time is up each group must decide where they will stand on the issue, right, left or middle. Being able to see visually what others in the class think should encourage interesting debate.

Some specific tips for each feedback section:

4Pl@y (Scenario 1):

Pete and Aneeta have been seeing each other for about 6 weeks. Things are going well, and they are both quite happy not to have started having sex with each other, but Pete has just asked Aneeta if she will send him an explicit photo of herself by text. He's never asked her to do anything like that before, and Aneeta feels uncomfortable with the idea. Is this an example of coercion? ANSWER = Maybe

Suggestions for follow-on discussion and debate:

- We recommend you discuss why the answer was MAYBE. See if the class can come up with the answer. This is because it was the first time Pete had asked this of Anita. If she said no and he left it at that, and applied no further pressure or request of this nature then it's **not coercion**. Equally if Aneeta really wanted to do this (and was aged over 18!!!) and did so it would not be coercion. If Pete asks again though after receiving a 'no' he is starting to apply **pressure**.
- Ask the class whether they know how a sex text picture could spread, through which kind of social media outlets?
- Ask the class how Aneeta should handle the situation
- Ask each group or pair to come up with two sentences about how to say no to Pete and share them with the class.
- Ask the class to think about how Pete should react to Aneeta saying no. Talk about how the two people within the relationship should be happy and not worry about what other people think.

Just Getting off (Scenario 2):

Marvin and Tom have been out a couple of times. Last time they met up, they kissed, and Marvin tried to take things a bit further, but Tom said he wasn't ready to go any

further yet. On their third date, Marvin tries to take things further again, but Tom still doesn't feel ready for that. Is this an example of coercion?

ANSWER = Yes

Suggestions for follow-on discussion and debate:

- Establish whether class understands why this is coercion – see if they can explain why it is.
- Because Marvin is aware of Tom's recent feelings on this, it is an example of coercion – Marvin is placing pressure to do something Tom isn't happy with
- Get the class to discuss how Marvin could have approached things differently? E.g. he could have talked to Tom about what he wanted first, rather than trying to take things further
- They could discuss and suggest ways to bring up this conversation – what would be best?
- General discussion about open communication within relationships, and how that is important in a good relationship.
- What about the difference between good and bad relationships? If someone puts this type of pressure on you a lot – is that a good relationship? The class could discuss recognizing when a situation is not good for you and your right to end things if something is making you unhappy.

Stay out late (Scenario 3):

Jo, Amber, Tariq, Jordan and Aneeta have been hanging out together on Friday night. Jo has to be home by 10.30pm or her dad gets really worried and angry. All her mates know this, but start saying that it's lame to go home that early and try to persuade her to stay out when she says she's heading off home. They do this quite a lot. Is this an example of coercion?

ANSWER = yes

Suggestions for follow-on discussion and debate:

- Again, establish whether the class understands why this is coercion…
- Coercion can happen in any and all relationships potentially – it doesn't have to be sexual
- Because the teasing or pressure is happening a lot over time this can be seen as on-going pressure or coercion
- You can discuss the **positive consequences** of Jo making sure she gets home on time and resisting pressure to stay out (e.g. she will show her dad that she is responsible and can be trusted to do what she agreed to do, which might in the future lead to her being allowed to stay out later to do other things which he restricted before).
- Ask the class how can Jo communicate with her dad about this? How could she approach this in a mature way with him?
- How should she negotiate with her friends about how long she can stay out? What can she do to reduce the likelihood they will act this way?

Touchy Feely (Scenario 4):

Nabila and Holly have liked each other for a while but have been shy about admitting it, in case the other didn't feel the same way. Nabila is older than Holly and she has had more sexual experience. One night at a party, they finally get together and Nabila suggests going upstairs. Holly is really excited and wants to be alone with Nabila and agrees happily. Once they're alone though Nabila wants to do things that Holly feels uncomfortable about. Holly tells Nabila that that is going too far at the moment, but Nabila continues trying to go further. Holly very firmly says no that she's not ready. Nabila realizes that Holly really isn't happy, and stops. Is this an example of coercion?

ANSWER = yes

Suggestions for follow-on discussion and debate:

- Establish whether the class understands why this was coercion
- Although Nabila stopped in the end she did apply pressure

- Perhaps make the point that girls as well as boys might be the one applying pressure
- Draw out idea that people's experience and what they feel happy about can differ, and that that's ok – it is good to go with what both people are happy with (e.g. both like kissing – so good to stay with kissing etc.).
- Perhaps get them to discuss the best ways to let someone know what you're happy with in advance
- Promote the idea of thinking ahead about this

Getting Ribbed (Scenario 5):

Chris doesn't have a girlfriend or boyfriend. His mates have been on at him to score with this girl in his class for ages. Chris thinks she's all right but he's quite shy and not really bothered about getting off with her. He'd rather just leave it but his mates won't give up on it, so he's thinking about trying something with her this weekend just to shut them up. Is this an example of coercion? ANSWER = Yes

Suggestions for follow-on discussion and debate:

- Again establish understanding about why this is coercion – Chris' friends keep going on about it
- Does the class think that people ever put pressure on others like this, have they ever been part of a group doing something like this?
- What could you do if you were in a group of people doing something like this to try to get people to stop
- They should discuss the rights of the girl involved here. Is it fair on her for Chris to try to get together with her if Chris isn't really that bothered about it?
- What does he really want? To get his friends to back off -communicate with her?
- Why are his friends pushing him? Do they understand what they are doing?

All the way? (Scenario 6):

Dale and Ayesha have been seeing each other for a few months. Recently Ayesha's friends have been talking a lot about having sex, and one of them, Alice, says that she's

done it with her boyfriend. Ayesha keeps suggesting to Dale that he should give her oral sex. Dale keeps saying that he thinks they should wait, he thinks things are fine as they are, but Ayesha says she wants more. Is this an example of coercion?

ANSWER = Yes

Suggestions for follow-on discussion and debate:

- Establish understanding about why this is an example of coercion
- How many types of coercion are going on here? See if they can spot that Ayesha may be being put under quite subtle pressure because of her friends talking about sex a lot as well as the direct pressure that Ayesha is putting on Dale to have sex.
- Ask the class to start to think about negotiation skills and options for finding a solution.
- Talk more about negative consequences, how might they both feel if they had sex and it didn't go well because Dale wasn't ready
- Talk about how first time for any sexual act should be with someone you trust and love.

Extension activities for some of the scenarios: Depending on how much time you have with the class this manual provides a number of optional extension activities.

Scenario 1 – 4PL@Y: Create your own poster campaign to raise awareness of the potential negative consequences of sex texting (see figure 1 for example).

Figure 1 – Example of sex texting awareness campaign

Scenario 2 – Just getting off : Ask the class what other myths or stereotypes about relationships they can think of. Examples are the man should pay for the date but does this mean the woman owes him something? Or does wearing tight clothes mean you should be treated in a sexual way? Each group could write their own five minute play on dispelling a particular myth or stereotype. This activity will utilize communication skills and negotiation skills.

Scenario 4 – Touchy feely: Divide the class into two groups. Ask one group to come up with phrases that would pressure someone into having sex. Ask the other group to come up with phrases to say no to being pressured. This will create a debate. The groups must keep going until the no group wins. Then the two groups should swap and see how it feels to understand both roles. This game aims to raise awareness of what it is like to feel pressured but also to allow the class to understand when they are the one's pressuring someone else into doing something. This activity helps to achieve that aim.

Part 2

In this part of the game the class will play as an unseen character. The class will see the world within the game through a character's eyes. The gender of the character that the class plays with will be randomly allocated each time the game is used. This avoids making assumptions about sexuality making the game potentially applicable to both heterosexual and homosexual players. It also avoids making assumptions about gender of victim and perpetrator in a coercive situation. Sexual coercion is often seen as a female problem, but it can happen to males too. And both males and females can be the perpetrator.

Press play to begin. There are two scenarios. Play them each in turn if you have time. Bruce and Gwen will introduce the premise of each scenario. The purpose of this part of the game is for the class to be involved in a coercive situation, and make decisions about how to do things differently. For the first scenario the class will play the role of the 'victim' or the one being coerced and for the second they will play the role of the 'perpetrator' or the one doing the coercing. In each scenario, the class sees the scenario play out and it will result in a coercive behavior being carried out. The class will be able to see how each of the two characters feels the following day (pretty bad!). In each scenario the game then 'rewinds' and the class can decide to respond differently to change the negative outcome. Once the negative outcome is changed through the class making different decisions for their player the game will once again demonstrate the outcome. This time however, the players will feel much more positive as no-one was pressured to do something they didn't want to do!

Scenario 1 – the class plays the character <u>being coerced</u>

There is one 'dummy' response option early on each time the scenario plays out, which just provides an opportunity for interaction. The class just gets to decide which piece of conversational response they want to give. On the re-play there is an important second opportunity to interact to change the outcome. A host character will interrupt the play to explain that things could go differently, and then the class should discuss what they think they should do or say to get a better outcome than last time. Once decided, you

can type in their response and they can see the scenario outcome differ as a consequence.

Your job is to facilitate that discussion, guide their thinking and ensure they make appropriate decisions about how to tell the other person to stop.

Scenario 2 – the class plays the character being coercive

Once again the class will see a coercive situation play out with an opportunity for 'dummy' interaction part way through. After the 'rewind' section the class can choose how to respond more appropriately when the person they are with indicates that they are not happy to continue. The host character will indicate when it is time to do this and it is your job to help the students decide what they should do and say differently from last time. As before, you type in their decision and the students will get to see the happier consequences of their better decision.

To End

At the end of the game a page of sources of help and support will be shown. We will also provide you with an electronic version of this and more information about getting support on the issue of sexual coercion, and relationships and sex more generally. We suggest that you email this information directly to all of the students in your class and/or provide them with the information in hard copy format so that they can get support if they need it.

We also suggest having a brief discussion about why it's a good idea to confide in someone you trust or seek support from an organisation or service if you are worried or upset by something to do with relationships, sex or sexual coercion. We recommend asking them to think of the person, or service or organisation (and they can use info you've given them) that they would feel most comfortable about going to, and making a promise to themselves that if they are worried, they will find someone to talk to to get help and advice.

Glossary

Facilitator	**You, the teacher**
Serious game	**A game used as a learning tool**
Sexual coercion	**When someone is pressured into doing something of a sexual nature that they do not want to**

Contact details

Please get in touch if you have used the game and manual and let us know how you got on! Feedback, good or bad, will help us develop and improve this tool.

Address: SASH research group, Applied Research Centre for Health & Lifestyle Interventions (ARC-HLI), Faculty of Health & Life Sciences, Coventry University, Priory Street, Coventry CV1 5FB

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Web: www.healthinterventions.co.uk

Email: info@healthinterventions.co.uk

We really do want to hear from you – so please get in touch!