

UFCFHQ-45-3 Comprehensive Creative Technologies Project Research
Documentation

GAMIFYING SEX EDUCATION

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1) Research Question

Can gamified methods be used to improve engagement and retention in sex education for secondary school children?

2) Research Methodology

The main research conducted within this project is qualitative secondary research building upon existing research in the gamification and game-based learning fields. The research includes journal articles, blogs, government publications and books; the research is provided as a literature review. Research topics such as learning types, player types, gamification, game-based learning and Sex and Relationships Education (SRE) were investigated as these are the most relevant topics to the project.

A competitor analysis of serious games and SRE based games were also conducted for a deeper understanding of existing products (seen in Appendix C). Analysis of such competitors helped to identify where educational games are failing and succeeding and what aspects of these competitors could be useful in the project artefact.

Future directions of the project may include user testing to evaluate the effectiveness of the project artefact. Due to ethical considerations and challenges around data collection within younger demographics, user testing will aim to be conducted with teachers, parents and students in higher education. The aim of user testing will be to provide thoughts and feedback and to measure success of the final artefact. User testing will be conducted through remote unmoderated testing and testers will be asked to fill out a questionnaire; examples of the questionnaire questions can be found in Appendix B. Artefact builds sent to testers will contain logic to record and measure specific metrics such as time played and success values. The ideal number of user testers would be 10-15 to receive an overall view of the artefact.

3) Ethical and Professional Principles

Participants of user testing will receive an information sheet, consent form and data privacy notice to provide them with all the information they need to be fully informed about the artefact and its contents. The data privacy notice will include information on how and why data will be used as well as how the data will securely be stored and managed.

One main ethical consideration for this project is the appropriateness of the content included, as sex education can be considered a controversial topic where views and opinions differ greatly. As such the syllabus used to scaffold this project will be sourced from the Department for Education's SRE curriculum.

Linked to this, certain topics may be offensive to those with differing religious views, restricting content to the curriculum set out by the Department for Education will minimise the negative impact of the project. Disclaimers will also be added to the final project artefact to ensure user testers are aware of the content included.

A major ethical concern with this project is the prospect of user testing with children, which requires ethical approval. Due to the time restraints of this project, it will not be possible to conduct testing with the target demographic in the timescales provided.

4) Literature Review

Cahill (2021) states that games have been used as learning tools for as long as centuries and mentions Chess being used to teach strategic thinking. The first written

justification of gamification was "The Game of Work" by Charles Coonradt, which recommended using the feedback loop from sports in the work environment to improve motivation and teamwork (Coonradt, cited by Christians 2018).

There are many models used to identify types of learners; FSLSM is seen as a reliable model that places learners on four dimensions, indicating a preference on each dimension (Wouters and Van der Meulen 2020). However, there is not a learning style model that is universally accepted (Khenissi et al, 2016). A study by Pashler et al (2009) concluded there is not enough adequate literature to support applying personalised learning-style assessment in schools. Rohrer and Pashler (2012) found similar results; there is limited evidence to suggest personalisation of teaching by learning styles has any great positive effect on learners.

In addition to learning styles, Bartle's research (1996) suggests players can be split into types depending on how they play games; Bartle splits players into four types: killer, achiever, socializer and explorer (as seen in Figure 1).



Figure 1 Diagram of Bartle's four player types (Bartle, 1996) as seen in Kumar, Herger and Dam (2020)

There are three main learning theories: classical conditioning, operant conditioning and learning through observation (Cherry, 2020).

Classical conditioning was discovered by Pavlov (2010). Games are full of conditioning mechanics; for example, collecting coins and killing enemies give rewards; providing positive reinforcement (Bycer, 2016). Whereas losing gear and experience on death is negative feedback; teaching the player to not die (Bycer, 2016).

Pritchard (2013) states operant conditioning as reinforcing a behaviour by rewarding or discouraging by punishing. Operant conditioning is naturally built into games through learning curves; where the difficulty increases as players gain more skills (Schell, 2020). Players start with simple actions and tasks, for which they get rewarded, then move on to combine their skills and knowledge for more difficult challenges.

Finally, learning through observation is learning through seeing the actions and consequences of the behaviour of other people (Cherry, 2020).

Game-based learning can be a beneficial educational tool to increase student engagement and motivation; as Cahill (2021) states, "the goal is for students to enjoy the process of learning itself" while Gee (2008) states humans and primates

can find learning highly pleasurable under the right conditions. Kapp (2012) describes games as "incredibly appealing" and engaging due immediate, direct feedback as well as consequences to player actions. Gamifying techniques cause students to be intrinsically motivated by the learning activity (Wouters and Van der Meulen 2020) which leads to active learning (Cahill 2021). Learning through games is also confidential in nature; Haruna et al (2018) state confidentiality encourages students to freely discuss sexual health matters, even in areas where such topics are not discussed openly. Haruna et al (2018) also students can learn at their own pace with game-based learning, free to explore their interest in the topic without embarrassment or judgement.

Techniques for gamifying content vary from simple methods to more theoretical tips and ideas. Deterding (2012) condemns reducing games to stock features such as badges, levels and leader boards due to the complexity of how games engage players. Implementation of these simple techniques does not automatically lead to user engagement; Deterding goes on to state instead of focusing on implementation of stock features, a deeper understanding of the needs to users' needs is more important. Kapp (2012) defines four main elements that make gamified experiences more engaging than traditional learning techniques; freedom to fail, interest curves, effective storytelling and immediate feedback. These elements are not expressly defined as game mechanics however refer to element's learners need for engagement, as Deterding suggests. True Education (2020), Haruna et al (2018), Mohammad (2014) and Kiryakovq, Angelova and Yordanova (2014) all also suggest game elements that motivate and engage players, with many game elements stated in multiple sources. Common game elements mentioned also focus on the adaptation of challenge as "if tasks are very easy of very difficult, is possible demotivation of learners and negative outcome" (Kiryakovq, Angelova and Yordanova 2014).

Game Mechanics	Human Desires					
	Reward	Status	Achievement	Self Expression	Competition	Altruism
Points	●	●	●		●	●
Levels		●	●		●	
Challenges	●	●	●	●	●	●
Virtual Goods	●	●	●	●	●	
Leaderboards		●	●		●	●
Gifting & Charity		●	●		●	●

Figure 2 Common game mechanics mapped to human desires, where the green dot indicates the primary desire of a mechanic (Bunchball 2010)

Good game design plays an important role in gamification, as well-designed game elements keep players engaged and wanting to continue playing. Different game mechanics can fulfil different human desires, or game dynamics (Bunchball 2010) as seen in Figure 2. Shi and Shih (2015) describe a game-based learning model that aims to help design and test educational games; the model includes the categorisation of game factors that should be considered when designing an educational game, starting with the game goals.

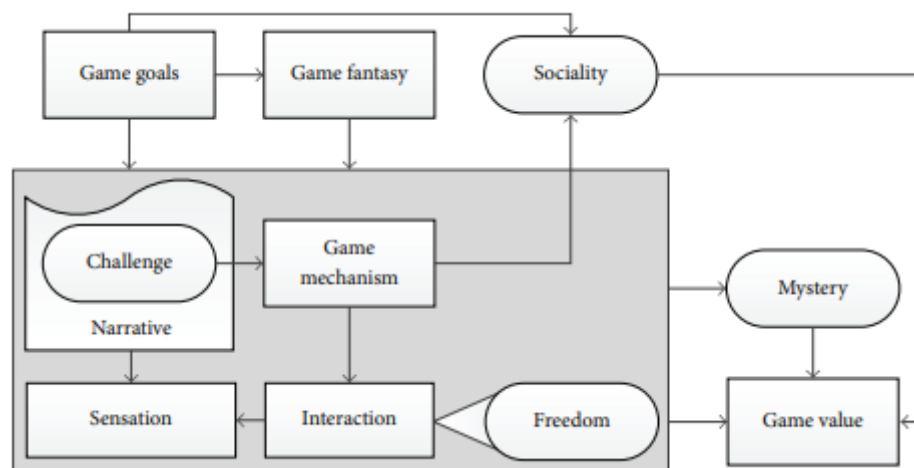


Figure 3 Game-Based learning model designed by Shi and Shih (2015)

Flow is a widely accepted term in game design, and critical for user engagement (Berube, 2021). Flow was introduced by Csikszentmihalyi (1990) who stated we enter flow when challenge aligns with our skill, but eventually either boredom (from not enough challenge) or frustration (from too much challenge) sets in. Berube (2021) states some elements that can affect flow in a video game and states two types of flow: microflow and macroflow. Microflow lasts for short periods of time and heavily engages users due to creating an emotionally intense state (Berube, 2021). Macroflow creates enjoyment and fulfilment in the player, often through a series of successful achievements (Berube, 2021).

Apple (2021) set out guidelines for creating UI that looks and functions well. Apple (2021) define three types of interface elements: bars (to provide navigation), views (to display content) and controls (to initiate actions). Babich (2019) defines four UI design principles to be followed to create a well-designed user interface:

1. Place users in control of the interface
2. Make it comfortable to interact with a product
3. Reduce cognitive load
4. Make user interfaces consistent

The Department for Education (2021) sets out guidance for what pupils should know by the end of secondary school including information about STIs, healthy relationships (seen in Figure 3) and the law.

Intimate and sexual relationships, including sexual health	<p>Pupils should know</p> <ul style="list-style-type: none"> • how to recognise the characteristics and positive aspects of healthy one-to-one intimate relationships, which include mutual respect, consent, loyalty, trust, shared interests and outlook, sex and friendship. • that all aspects of health can be affected by choices they make in sex and relationships, positively or negatively, e.g. physical, emotional, mental, sexual and reproductive health and wellbeing. • the facts about reproductive health, including fertility, and the potential impact of lifestyle on fertility for men and women and menopause. • that there are a range of strategies for identifying and managing sexual pressure, including understanding peer pressure, resisting pressure and not pressurising others. • that they have a choice to delay sex or to enjoy intimacy without sex. • the facts about the full range of contraceptive choices, efficacy and options available. • the facts around pregnancy including miscarriage. • that there are choices in relation to pregnancy (with medically and legally accurate, impartial information on all options, including keeping the baby, adoption, abortion and where to get further help). • how the different sexually transmitted infections (STIs), including HIV/AIDs, are transmitted, how risk can be reduced through safer sex (including through condom use) and the importance of and facts about testing. • about the prevalence of some STIs, the impact they can have on those who contract them and key facts about treatment. • how the use of alcohol and drugs can lead to risky sexual behaviour. • how to get further advice, including how and where to access confidential sexual and reproductive health advice and treatment.
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Figure 4 Department for Education (2021) what students should know about sexual relationships and sexual health

The Department for Education (2021) states that SRE should give young people tools and information to form healthy relationships; this contradicts a study by Pound, Langford and Campbell (2016) who found young people thought SRE was negative, poorly delivered and insufficiently comprehensive. A comprehensive sex education is important to help teach consent and reduce rape culture Ezaydi (2021). Glazzard and Stones (2020) provide advice and support for teachers to aid in delivering SRE content in schools, they provide information on all topics of the SRE policy set out by The Department for Education (2021).

5) Research Findings

Many game mechanics already facilitate the main ways humans learn, to enforce the game rules. Observant learning can be used to encourage certain real-life behaviours, while most research focuses on negative consequences of this (mainly aggression) observant learning could be used to encourage positive behaviours around sexual health; for example, seeing how simple an STI test is through the context of a digital character could encourage a user to also get tested if they needed to in the future.

There is much controversy around learning styles due to the large number of ideas and models on the subject. Adapting educational content to an individual's learning style has been shown to have benefits of engagement and knowledge increase, however studies have also shown that the benefits are not very large; the benefits gained don't always outweigh the large logistical task of adapting content to individuals. An educational game which accommodates multiple learning styles could be used to engage many different learners without the logistical complexities. Similarly, including game elements that appeal to each of the player types defined by Bartle (1996) will engage all players with the game content.

Figure 5 displays the most mentioned game elements that lead to user engagement and motivation as seen through research.

Game Element	Description	Sources
Rapid and Immediate Feedback	Feedback is immediate and rapid for any player actions, where the player can see the consequences or results of their actions.	Mohammad (2014) Haruna et al (2018) True Education (2020) Kapp (2012)
Clear Goals	Clear and achievable goals for the player to follow.	Haruna et al (2018) (Kiryakovq, Angelova and Yordanova 2014)
Narrative	A story or narrative alongside the gameplay.	Haruna et al (2018) True Education (2020) Kapp (2012)
Freedom to Fail	There are no large consequences for failing, the consequences are manageable for the player so as not to disengage them.	Kapp (2012)
Interest / Challenge Curves	The level of challenge increases as the learners gain more knowledge and skill.	(Kiryakovq, Angelova and Yordanova 2014) Mohammad (2014) Haruna et al (2018) True Education (2020) Kapp (2012)
Social Connection	Connection with other players, to provide motivation and engagement.	Mohammad (2014) True Education (2020)
Repeatability	Learning activities can be repeated in case of failure.	(Kiryakovq, Angelova and Yordanova 2014)
Choice/Control	Objectives completable through multiple paths and learners control over the paths they take.	(Kiryakovq, Angelova and Yordanova 2014) True Education (2020)
Context	Allowing learners to understand the context of what their learning, to understand the significance.	Mohammad (2014)

Figure 5 Table of common game design features found through research.

Defining a policy for teaching SRE is the responsibility of individual schools, the government defines topics students should know however delivery is unique per school. Parents can also remove their child from SRE classes if they wish, and religious schools can omit information due to religious beliefs. There have been many policy changes that haven't changed how students and teachers view SRE, many still believe it is outdated, uncomfortable and not sufficient. An educational game

could encourage young people to confidentially explore sex and relationships topics without embarrassment or judgement.

6) Impact of Findings

The types of learning and the theory of good game design has shaped the game design of this project, accommodating for the different types of learning as well as considerations for flow, challenge and player styles. Games inherently accommodate for a range of learning styles and therefore adaptation of the game mechanics to the user's preferred learning style won't be implemented in this project.

Techniques important to successfully created a gamified experience has been clarified through research of game-based learning and gamification; these techniques can be used to aid in good game design for the final project artefact that will engage and motivate players to learn more about the content.

Figure 6 shows the result of the process of the game-based learning model designed by Shi and Shih (2015).

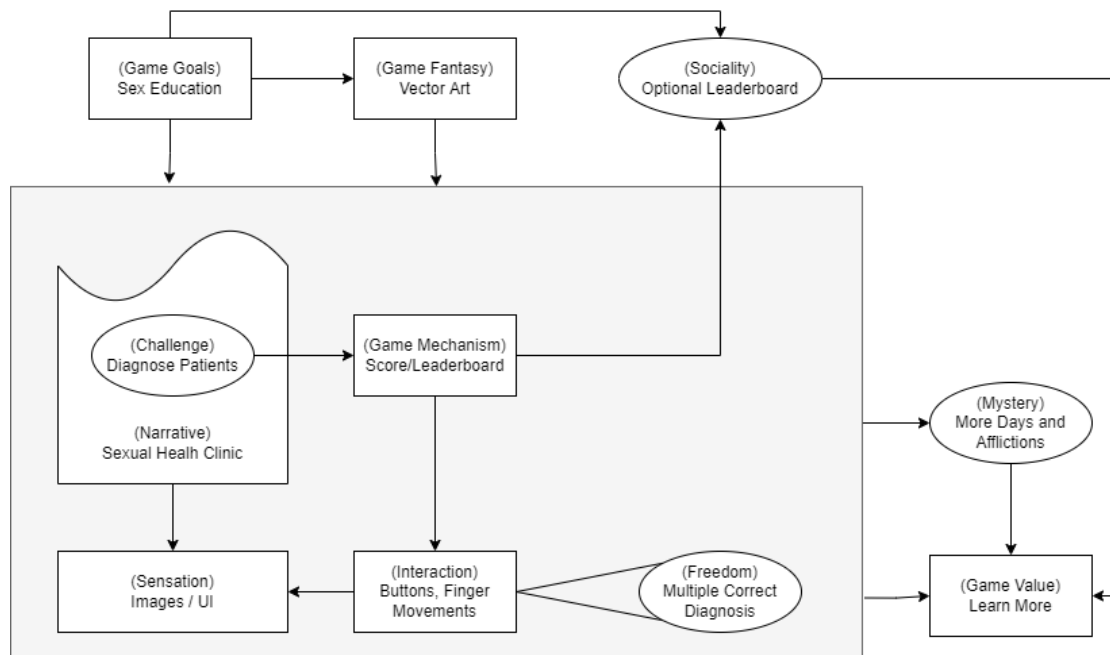


Figure 6 Completed GBL design diagram produced through the GBL design process by Shi and Shih (2015)

Figure 7 shows the UI mock-ups designed by following guidance from Apple (2021).



Figure 7 UI Mock-ups of Project Artefact

The content of the final artefact has been focused to SRE topics given by The Department for Education (2021) and has been scaled to account for the project's time scale. The following is a list of learning objectives to be completed by playing the final artefact:

- Should know the range of contraceptive choices available.
- Should know how different sexually transmitted infections (STIs) are transmitted, how to reduce risk and the importance of and facts about testing.
- Should know about the prevalence of some STIs, their impact and key facts about treatment.
- Should know how to get further advice, including confidential sexual and reproductive health advice and treatment.

7) References

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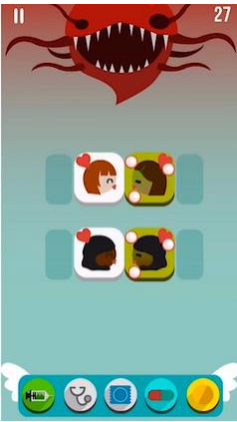
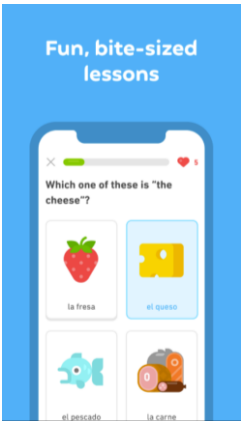


Appendix A: Project Development Blog

<https://zar67.github.io/cctp-devlog/>

Appendix B: User Testing Questionnaire

User Information	Educational Performance	
<p>Please select your age range...</p> <div>Choose ▾</div>	<p>Do you feel you have been taught about the range of contraceptive choices available through playing Symptoms Please?</p> <p><input type="radio"/> Yes</p> <p><input type="radio"/> No</p>	<p>Do you feel playing Symptoms Please is a more comfortable experience than the sex education you received at school?</p> <p><input type="radio"/> Yes</p> <p><input type="radio"/> They're the same</p> <p><input type="radio"/> No</p>
<p>Please select the option which best describes how you feel about this statement: "My sex education at school taught me everything I needed to know about sex, relationships, consent and my body."</p> <p><input type="radio"/> Strongly Agree</p> <p><input type="radio"/> Agree</p> <p><input type="radio"/> Neither Agree nor Disagree</p> <p><input type="radio"/> Disagree</p> <p><input type="radio"/> Strongly Disagree</p>	<p>Do you feel you have been taught about how the range of STIs are detected, transmitted, protected against?</p> <p><input type="radio"/> Yes</p> <p><input type="radio"/> No</p>	<p>Do you feel Symptoms Please has provided unbiased information about sex and relationships?</p> <p><input type="radio"/> Yes</p> <p><input type="radio"/> No</p>
<p>Please select the option which best describes how you feel about this statement: "My sex education at school was engaging and fun."</p> <p><input type="radio"/> Strongly Agree</p> <p><input type="radio"/> Agree</p> <p><input type="radio"/> Neither Agree nor Disagree</p> <p><input type="radio"/> Disagree</p> <p><input type="radio"/> Strongly Disagree</p>	<p>Do you feel you have been taught about how the range of STIs are treated?</p> <p><input type="radio"/> Yes</p> <p><input type="radio"/> No</p>	<h3>Improvements and Feedback</h3> <p>Please suggest any topics you would like to see included in a future version of Symptoms Please...</p> <p>Your answer _____</p>
<p>Please select the option which best describes how you feel about this statement: "I felt comfortable in sex education classes at school."</p> <p><input type="radio"/> Strongly Agree</p> <p><input type="radio"/> Agree</p> <p><input type="radio"/> Neither Agree nor Disagree</p> <p><input type="radio"/> Disagree</p> <p><input type="radio"/> Strongly Disagree</p>	<p>Do you feel how to get further advice and treatment about sexual and reproductive health has been effectively communicated through Symptoms Please?</p> <p><input type="radio"/> Yes</p> <p><input type="radio"/> No</p>	<p>Please suggest any improvements you would like to see in a future version of Symptoms Please...</p> <p>Your answer _____</p>
	<p>Do you feel playing Symptoms Please is more engaging than the sex education you received at school?</p> <p><input type="radio"/> Yes</p> <p><input type="radio"/> They're the same</p> <p><input type="radio"/> No</p>	<p>Please rate your overall experience playing Symptoms Please...</p> <p>1 2 3 4 5 6 7 8 9 10</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/></p>

Appendix C: Competitive Analysis

Criteria	Tap That 	Duolingo 	Happy Play Time 	My Sex Doctor 
Reference	Peiying Feng (2016) Tap That (2016) [mobile game]. Available from: https://pfeng.cc/work/tap-that [Accessed 15 December 2021].	Luis von Ahn (2012) Duolingo (Version 5.38.4) [mobile app]. Available from: Google Play [Accessed 15 December 2021].	Tina Gong (2014) HappyPlayTime (2014) [web game]. Available from: https://play.happyplaytime.com/ [Accessed 15 December 2021]	Fabrizio Dolfi (2013) My Sex Doctor (Version 1.1.7.1) [mobile app]. Available from: Google Play [Accessed 15 December 2021]
Platform	Mobile	Android, iOS and Web	Was iOS (banned) Now Browser	Android and iOS
Price	Free	Free (paid premium)	Free	Free
SRE Topics	STIs, Condoms	N/A	Female Masturbation	All
Visual Style				
Core Gameplay	Keep humans healthy by giving them condoms and medicine to protect them.	Answer questions correctly by selecting from multiple choice, writing out answers or speaking answers.	Complete a range of motions by tapping and swiping to make the character happy in a limited time frame.	Selecting a topic and reading about it.