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Helping   
A cosy serious game that teaches healthy wellbeing habits

Josie Wood

10509521

BSc (Hons) Computing & Game Development

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## Acknowledgements

## Abstract

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## Word Count

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## Code link

## 1 - Introduction

Managing and looking after mental health is as important as maintaining good physical health, but people aren’t always taught the best practices and techniques to do so. In some cases, this can lead to people only receiving support once they reach a ‘breaking point’, rather than learning preventative and healthy habits early on.

In recent years, more people than ever are playing video games and feeling the mental health benefits - community, relaxation, and rest time. As the industry has grown, so has the number of games centred around mental health, and the wholesome games movement.

This project aims to combine these two elements. Research has been conducted into how media, particularly games, affect their audiences, and how the fields of medicine and psychology approach mental wellbeing and improving mental health. This informed the creation of a game which aims to support the mental health of players, offering both short term benefits of relaxation during play and long-term benefits of learning and adopting healthy habits outside of play.

## 2 - Background, objectives & deliverables

### 2.1 Project Background

Games for wellbeing and mental health fall into the subcategory of serious games (or applied games). There’s no single definition of a serious game, but the most used is ‘Games which do not have enjoyment, entertainment, or fun as their primary purpose’ (Chen & Michael, 2005).

Serious games have existed since the early days of video games, and multiple titles have reached high levels of popularity and financial success. One of the earliest examples is the Microsoft Flight Simulator franchise, the first edition of which was released in 1982. It is one of the few flight games which focuses on civil aircraft and doesn’t feature combat. The 40th anniversary addition released in 2022 reported over 10 million players and is still receiving updates (Neumann, 2022). In addition to commercial success, studies have suggested that the game has ‘capability to improve novice student performance in an aircraft’ (Callender, et al., 2009), supporting the educational benefits of serious games.

The design of serious games specifically to improve mental health has also proven successful. A meta-analysis of ten studies into serious games for mental health suggested that they can be effective for reducing disorder-related symptoms in patients (Lau, et al., 2017).

### 2.2 Preliminary research

#### Research aims

To further establish the background of this project, a survey was created to explore the topics of Media and Mental Health.

This research aims to help develop the background of the project and identify key concepts to be further investigated throughout the project. The questions aren’t directly related to the proposed product, but rather, to people’s attitudes and experiences with the subjects. There is a mix of qualitative and quantitative data points, to allow for trend analysis and identification of specific areas that respondents resonate with.

#### Demographic of respondents

The survey received 17 responses.

Most of these respondents identified themselves as being aged 18-24 (13/17%) and employed (15/17%), but there were also 4 respondents aged between 25 and 64, and 2 respondents that identified as a student or unemployed. There was no clear gender divide amongst respondents, with a mixture of cisgender, transgender, and gender non-conforming identities.

This is a useful demographic for this research – the proposed product is most likely to be popular amongst 18-24 year olds, and the insights from a variety of age groups and backgrounds bring new perspectives to inform development.

#### Media consumption

The media section of the survey aims to gather insight into how subjects interact with media on a regular basis, and how it has affected their life.

### 2.3 Objectives

The primary objective of this project is to create a serious game that provides entertainment and escapism whilst simultaneously teaching the players good mental wellbeing practices.

To better understand this objective and stay on task throughout development, it has been broken down into smaller, measurable objectives as follows.

* Create a research document on mental health practises and therapeutic techniques informed by psychology. Write up at least 3 techniques that could be applied to the project by February so they can be referenced in the writing portion of development.
* Write at least one character dialogue with a full storyline that they player can interact with. Complete this by 13th February so it can be sent out as a standalone text game to at least 5 testers for early feedback.
* Write at least 5 minutes’ worth of dialogue for the player to read by the completion of the project. Measure this by entering the wordcount into wordstotime.com.
* Make a slice of gameplay that can run from start to end without any major errors or bugs (eg, software doesn’t crash, players can move around and access the storyline as expected).

### 2.4 Deliverables

The deliverables for this project include both the working build of the game and the research that informs it.

The working game will be delivered as an executable which can be played on a PC with mouse and keyboard/keyboard only. The game will be a vertical slice of the game, with limited characters and storyline to interact with, with the intention that it can be built upon and expanded at a later point. All art assets featured will be original, and copies of the original PSD files and PNG files will be saved in a folder in the submission folder.

Alongside the game itself, two small scale research documents will be delivered. These will inform the game, and act as an educational resource available for others. One will detail the steps and methods employed in the development of a serious game, whilst the other will provide a quick reference guide to different mental practises and habits encouraged in therapy.

## 3 - Literature review

### 3.1 Psychological approaches to managing mental illness.

#### NHS treatment and trends

The NHS classifies a group of the most prevalent anxiety and depression disorders as Common Mental Disorders, or CMDs (National Health Service, 2016). They characterise CMDs as disorders which *“cause marked emotional distress and interfere with daily function, but do not usually affect insight or cognition”*, and note that despite their comparative lack of severity, their prevalence among the population makes them a large burden to society as a whole.

As of the 2014 APMS interview, medication was the most common treatment prescribed to respondents for mental health, accounting for 11.6% of results compared to just 3.0% of people receiving psychological therapy. Of the psychological therapies offered by the NHS, Cognitive Behavioural Therapy (CBT) is the most used, followed by counselling and other therapies. (National Health Service, 2016)

Studies have suggested that the most effective approach for treating depression and anxiety disorders is a combination of medication and CBT, in part due to the fact that the combined approach is more acceptable to many patients who struggle with mental health stigma. (de Jonghe, et al., 2001).

Whilst the Improving Access to Psychological Therapies programme introduced in 2008 aims to reduce waiting times for psychological therapy to 6 weeks from referral, in practice in 2013 one in ten people were waiting over a year to receive treatment. (We need to talk coalition, 2013).

#### Cognitive Behavioural Therapy

Cognitive Behavioural Therapy is an approach to treating psychiatric disorders that is built around Beck’s model of the Cognitive Triad. (Beck, 1979). In summary, this theory identifies a cycle of behaviour, thoughts, and feelings which influence one another. Individuals struggling with mental health issues need to identify and break this cycle to feel better, for example by looking critically at their negative thoughts and finding evidence to disprove them. (Gatchel & Rollings, 2012)

#### Counselling

Counselling is a type of talking therapy that can help patients cope not only with mental health issues, but with complicated emotions that may emerge because of life events, physical health conditions, or identity issues. (NHS UK, 2020) A trained therapist encourages the patient to talk openly about their feelings, and can suggest techniques to help the patient understand and solve their issues based on the situation. These techniques can arise from several different psychological approaches, including Humanistic, Cognitive, Behavioural, Psychoanalytic, Constructionist or Systemic. (McAdams, 2023)

#### Alternative approaches: Nature-based therapies

Nature based therapy, or eco-therapy, is a new way of looking at mental health and how it is connected to the world around us. First conceptualized in 1992, Theodore Rozak stated that the core principle of ecopsychology is that *‘there is a synergistic interplay between planetary and  
personal well-being’*. (Roszak, 1992). While this is a bold statement and suggests a radical new way of thinking, the attitude is mirrored by the more widely known and accepted systemic approach to mental health; the individual patient is affected by their relationships and interactions within a larger group.

Nature based therapies are generally centred around doing outdoor activities in nature. (Mind UK, 2021) The activities themselves can vary from animal-assisted therapy and environmental conservationism to wilderness therapy and exercising outside.

Mind UK suggests the following activities to help patients explore using nature to improve their wellbeing:

* Grow or pick food
* Bring nature indoors
* Do activities outdoors
* Help the environment
* Take notice of nature
* Connect with animals

Each of these align with Rozak’s initial description of ecopsychology, and provide an accessible way for patients to take small steps to improve their mental wellbeing.

Studies have shown that nature-based therapies have a positive impact on patients suffering from diverse diagnoses, spanning from obesity to schizophrenia. (Annerstedt & Währborg, 2011). More generally speaking, research has shown that people who spend 120 minutes a week in nature are more likely to have good health and mental wellbeing. (White, 2019).

On the other hand, nature-based therapies aren’t always as accessible to patients as other treatment methods. Patients living in cities, who don’t have their own transportation, or who work full-time are less likely to be able to get out into nature, especially on the regular basis required to make a sustained change to mental wellbeing. Additionally, patients struggling with serious mental health concerns may be reluctant to try a treatment which could be misconstrued as minimising their problems – “you just need some fresh air! Go for a walk!”.

### 3.2 Learning and Serious games

#### Psychological theories on learning

Whilst a full analysis of psychological learning theories is out of the scope of this paper, a brief explanation of the key approaches is given to provide context on how serious games can educate their players.

Piaget is one of the earliest theorists of constructivism, a learning theory which suggests that rather than passively absorbing information, people learn by experiencing the world and using those experiences to build their own knowledge base. (Brau, 2020).

Instructors facilitate learning, presenting ideas and concepts to learners who must then reflect on previous knowledge and use new information to come to their own conclusions and build up their knowledge base. (Piaget, 1952)

Constructivism is, however, criticised for failing to acknowledge the importance of tangible items in the process of learning about them, encouraging social thinking, and leading to poorly structured education that leaves struggling students behind.

Bandura’s social learning theory puts more emphasis on learning from others, rather than alone. It is a behavioural approach that emphasizes the importance of observing, modelling, and imitating others.

Another person must model a behaviour, and if the observer pays attention, retains the memory of the behaviour, is able to reproduce it and is motivated to do so, then they will imitate the behaviour themselves, thus learning it. (Bandura, 1977)

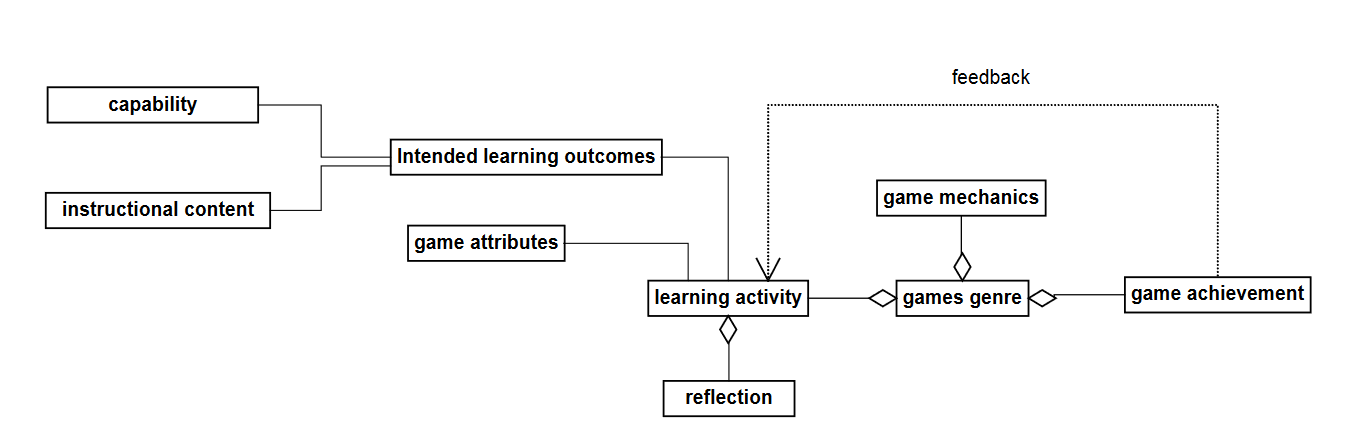
The biggest critique of social learning theory is that it doesn’t account for the internal thought processes of the individual which contribute to whether they decide to imitate the behaviour. It is deterministic and ignores the effect of free will.

#### Serious Games Conceptual Framework

The Serious Games Conceptual Framework is a model proposed by researchers at the University of Southampton to identify a clear structure of both learning and gaming requirements which should be met to create a successful serious game. (Yusoff, et al., 2009).

In this structure, learning outcomes are defined using the instructional content, or subject matter being taught, in combination with the capability of the player. An example of this kind of learning outcome could be ‘user can recall all of the cities they were taught about’. The learning activity should aim to achieve the learning outcome using the game attributes, such as interaction or in-game rewards. The genre and achievement objectives of the game should align with the learning activity and outcomes the developer wants to instil in users.

This framework provides a good structure for developers to create serious games, which didn’t exist prior to its creation. However, as a relatively new concept, there is a lack of scientific study and research to support its effectiveness in producing successful serious games.



## 4 - Method of approach

### 4.1 Tools

#### Asset Creation

All the visual elements of this project have been custom made using the Game Design Document as reference.

The 2D sprites, including characters, environments, and user interface, are made in Adobe Photoshop. They can all be found as both PNGs and original PSDs in the assets folder.

Calligraphr is used in conjunction with Adobe Photoshop to create a custom font for the game.

Audio elements featured in the project are a mixture of original and third-party assets. Original audio assets are recorded and edited using Audacity and can be found in the assets folder. Third-party assets are referenced in the credits and the Third-party-assets.txt file in the assets folder.

#### Development

The game is developed in the Unity engine. The development environment is Visual Studio for Unity is used, and all executable code is written in C#.

The branching narrative is written using YarnSpinner, an opensource dialogue tool that has Unity integration.

#### Project Management

Google sheets is used for planning and tracking development, for example, the creation of the Gantt chart.

Trello is the primary sprint planning tool. A Kanban board is regularly updated to keep track of tasks.

Git and the GitHub Desktop application are used for version control.

### 4.2 Project Management

#### Start of the project

At the start of the project, the Gantt chart was created in Google Sheets, informed by the project vision and risk analysis outlined in the Project Initiation Document.

To account for the biggest risk to the project, delays due to chronic illness, three buffer periods were planned into the Gantt chart to make up for any missed time. In winter of 2022 a prolonged period of illness halted development. Because of the planned buffer periods, a few months of illness only put the project 3 weeks behind schedule. A revised Gantt chart was created in January to account for this delay and add more buffer periods in the following term.

The Trello board was also started at the start of the project. It is a Kanban board with columns for *Backlog*, *To-do this sprint*, *Doing*, *In Review*, *Completed this sprint*, and *Finished* tasks. Cards were created and placed in the Backlog column using the Gantt chart tasks, and were colour coded and labelled according to sprint.

An empty Sprint Record document was started with sections to document the sprints as the project progressed.

#### Sprint Process throughout the project

**Sprint planning** – In Trello, move items from *Backlog* to *To-do this sprint*. Write up the plan in the Sprint Record.

**During sprint** - Work on current items and move them in Trello to *Review* and then *Completed this sprint*.

**Sprint Review** – Take a step back to review work completed. Move Trello cards from *Completed this sprint* to *Finished.* Write up completed work in the Sprint Record, answering the questions:

* What did I do this sprint?
* What went well?
* What didn’t go well?
* Were there any blockers?
* What actions can I take to avoid/work past these blockers in future?

**Backlog refinement** - Look at the state of the project, remaining time, and project goals and use this to add, remove, or edit items in the Trello backlog ready for the next sprint. Ensure all branches of version control are up to date with one another before starting a new sprint.

Every two weeks, a meeting is held with the supervisor to discuss progress and get advice on the project.

### 4.3 Data collection procedures

Data collection and user testing has been used throughout the project to help inform development.

Every user testing and data collection session follows the same basic procedure for setup, execution, and analysis.

#### Set up

Each testing session should have a clear objective/question to answer and be relevant to the project. This objective should be documented before the session goes live and referred to in the analysis stage.

#### Execution

At the data collection stage, a disclaimer outlines how the results will be used, and how participants can withdraw from the study if desired, to ensure ethical standards are met.

The testing sessions must be public until at least 5 responses have been gathered.

Any questions asked of participants need to be carefully considered to ensure:

* A mix of qualitative and quantitate data is gathered.
* Questions are rephrased in both directions to avoid leading bias.
* All respondents answer questions in the same order with the same context.

#### Analysis

All data collection and testing sessions are documented in *Data Collection and User Testing*. Each entry in this document includes details of:

* The start dates.
* Aim of the research.
* Format of research (survey, questionnaire, any additional materials provided to users)
* List of any artefacts created.
* Number of respondents
* Point-by-point analysis of each result: explaining what the question aimed to identify, summarising the results, and outlining how the findings can be applied to the product.

## 5 – Implementation

### 5.1 Mental health and wellness content

To establish a background for the mental health aspect of the game, the *Media and Mental Health* survey asked respondents about their experiences and attitude regarding mental health issues.

Some questions focussed on investigating whether there is a demand for the product being created. The overall result confirmed the demand for such a product, with 88.2% of respondents saying their mental health could be improved.

Other questions looked at how people currently deal with strong emotions. Common themes of nature, exercise, and mindfulness ran throughout the responses, which helped inform the approach to treatment the product would focus on.

For more information on the *Media and Mental Health* survey, see *Data Collection and User Testing*.

The game focuses on nature-based therapies and mindfulness as techniques to help manage mental health. These techniques were chosen for the following reasons:

* Responses in *Media and Mental Health* suggest a willingness and success in respondents to utilise these approaches in their daily lives
* They are both easily applied to a self-help context: mindfulness techniques are focused on the self anyway, and whilst formal nature-therapy requires a trained therapist, the principles and exercises can be practiced independently with minimal supplies.
* Using nature to improve mental health is less well known than formal therapies such as CBT and counselling, so it’s helpful to be able to bring awareness of it to an audience who otherwise may not have considered it.

Because the product delivered is a vertical slice of gameplay, only one character can be introduced for the player to interact with and help.

The chosen character, Mouse, is represented as an individual that struggles with feelings of anxiety, and depression. These are some of the most experienced symptoms of poor mental health, so choosing to represent them in the non-player-character encourages the audience to empathise with and understand them.

The storyline to help Mouse involves the ‘do activities outside’ element of using nature to improve wellness, as identified by Mind UK. The player explores and plans a woodland trail for them to follow and be immersed in nature. In exploring individually first, the player gets the fun and enjoyment of the exploration mechanic and navigating through the woodland. This offers the short-term enjoyment and relaxation element of gameplay. When this route is introduced to the Mouse and they are also helped, it confirms the idea that an outside activity such as following a trail can help improve wellness and mental health, offering the longer-term knowledge and understanding.

### 5.2 Serious games principles, educational approach

The learning elements of the game are designed following the Serious Game Conceptual Framework (SGCF) and the concepts of modelling identified in the behavioural approach to learning. There are two levels of learning involved in the game – the player character and NPC learn from one another to manage their mental health, and the user learns from their interactions and the gameplay to improve their own mental health.

In the application of the Serious Games Conceptual Framework, every element of the game play and design relates to a stage in the framework.

To ensure capability, meaning the players are capable of learning and applying the content, the instructional content is focussed is on mindfulness and nature-based therapies, two accessible applications of psychology to improve mental health with minimal resources or complex psychological understanding required. For more information on the psychological side of the project, see *Mental Health and Wellness Content*.

The intended learning outcomes are identified using the capability and instructional content, in this case, “player can understand and apply mindfulness and nature-based therapy principles to improve mental wellbeing”.

This is translated into the game as the learning activity. The genre is narrative story game, and as such the main mechanics are interacting with NPCs and the game world. Achievements in the game are based on successfully deducing information from interactions with the NPC, exploring the world to find items, and eventually taking the NPC on a woodland walk. Each of these tasks and achievements teaches the user about how mental health can affect people, and how being out in nature can help soothe some of those issues.

In addition to following the SGCF, the behaviourist model of learning through modelling is applied to reinforce learning outcomes.

In the story, the player models the healthy behaviours for the Mouse, reminding them and teaching them that they are also capable of completing the steps and feeling the positive benefits. After observing the player character start the conversation with them, forage for wild food, and embark on an adventure in the woods, the Mouse feels confident to imitate the behaviour and join the player on a new adventure.

In turn, both characters in the game model the healthy habits for the user themself. The player observes characters with poor mental wellbeing establish a new friendship, venture out to try a new hobby outside, and go on a walk through the woods to ground themselves. They also get the see the positive impact it has on the characters as they discuss feeling better due to their actions, thus providing motivation for the user to imitate their actions to improve their own mental wellbeing.

### 5.3 Narrative and Game design

#### Narrative Design

As a story driven game, the narrative design is one of the most important elements of making the project feel complete and enjoyable.

A key consideration in the narrative design is ensuring that the story is built around the gameplay, rather than slotting gameplay elements in between narrative points. In this instance, this means looking at how the character can interact with the world, and building the narrative around that.

The primary objective of the game is to help another character using mindfulness and nature-based therapy techniques to improve their mental health, in turn teaching the user about these techniques. This means that the player character must interact with someone who could benefit from this help, have a reason why they haven’t helped before, and be in a setting where this type of help makes sense.

In order to satisfy these gameplay requirements, the narrative of the game follows a player character who is new to a small, nature surrounded village, and who meets a new neighbour who exhibits signs of low mood and anxiety.

The narrative is communicated to the player visually, as well as through the storyline told by character interactions and dialogue. To make the story progression feel more immersive and impactful, the art for the Mouse character changes as the story progresses. As the player starts to become friendlier with them and begins encouraging them to think about getting back outside again, the Mouses body language, expressions, and appearances adapt to mirror the internal changes. When the player first meets them, they are in their pyjamas, with bags under their eyes and a small smile. As they go on, the mouse begins smiling wider, the bags under their eyes go away, and they start getting changed into day clothes and boots ready for a hike. This makes the change easier to see and shows the player that what they’re doing is actively helping the character.

#### Writing and dialogue

Dialogue between the player and the Mouse is the main element of gameplay, so this writing is important in making the game fun, interesting, and educational.

The writing style and voice was defined before any dialogue was written, to ensure that it suits the narrative and to provide a framework to refer to throughout the writing process.

Because the project is so dialogue heavy, sentences are kept short and snappy, so they don’t become a wall of text for the player to read through. In addition, the tone of both characters is chatty and informal, aiming to mimic natural speech as much as possible so it doesn’t feel like reading a novel. This also supports their characterisation as people who are friendly and relatable despite their struggles.

To test the dialogue writing style, a short dialogue demo was created and sent out to testers before actual dialogue was written. This aimed to gather user feedback regarding the writing style, and how well characters are communicated using text-only. The general response was positive, with testers enjoying the chatty nature and thorough descriptions of characters. There was some feedback about how the tone of answers seemed to change throughout the dialogue, making the story feel disjointed. As a result, in the final dialogue, more care was taken to create branching options that deliver the same content but with different tones and attitudes based on previous interactions. For a detailed breakdown on the Dialogue Demo and its results, see the *Data Collection and User Testing* document in the appendix.

In addition to the changes made as a result of testing, the writing style was also adjusted to account for the restrictions of implementation in the game. In the demo, longer form sentences from the point of view of a narrator describe the character and interactions to the player. In the actual game, forever, there was no easy way to implement this narrator in a way that felt natural and in keeping with the rest of the game. Therefore, the content delivered by the narrator was replaced by an internal monologue which displays the characters thoughts in thought bubbles throughout dialogue scenes. This is written in a shorter, snappier form to mimic the player character voice, making it useful not only to describe the world the player sees, but also to add personality and context to their choices and actions.

#### Level Design

A key element of the game is the woodland area which the player explores to find good foraging spots to show to Mouse. In the vertical slice provided in this project, this is the only mechanic the player experiences apart from the primary dialogue mechanic. Successfully exploring the area is also required in order to move the story forward and ultimately complete the game, so it’s important that this part of gameplay is enjoyable and satisfying for players.

The aim is to have the activity of exploring the area intrinsically rewarding for the player in addition to the extrinsic reward of progressing the storyline. This is achieved in part through good level design.

The concept of denial and reward is applied at the entrance of the woodland to encourage exploration. As soon as they enter the woodland, players can see a large area filled with wild food and indicated as a good foraging spot. They immediately know that this is one of the spots they are trying to get to, but there is a row of shrubs between them and the area. To successfully reach the area, they need to navigate all around the edge of the woodland to finally reach the reward.

Leading lines are used to subtly encourage the player to explore in the right direction – rows of shrubs are placed in line with the ideal path, and player is effectively funnelled through the environment. There are enough spaces and open areas that it still feels like an open area free to explore, but the subtle direction ensures players aren’t wondering around aimlessly and instead feel like they are making progress.

In following the leading lines and trying to reach the large area visible from the entrance, players are automatically lead through other good spots on the map. This is a concept called ‘breadcrumbing’ and tells the player that they are heading in the correct direction. This also means that if for whatever reason the player gets bored of exploring the woodland, they don’t need to reach the big area at the end in order to satisfy the objective and move the story forward. If they do enjoy the process of exploring, they are rewarded not only with the large area at the end, but also with smaller, trickier to find spots which are away from the natural path, rewarding deeper exploration.

### 5.4 Technical implementation

#### Dialogue and branching narrative

The branching narrative system for the project is built around the Yarn Spinner writing tool and the accompanying plugin for Unity. All dialogue is written in .yarn files, a plain text format that utilizes special syntax to create files which can be read by the Yarn Spinner framework.

The Yarn Spinner Visual Studio Code extension makes it easier to write in the correct syntax, and provides other helpful features, such as the ability to preview dialogue within VSCode. This was used in the development process to check flow and rhythm of dialogue quickly throughout writing. The extension also makes it easy to export dialogue in a runnable html format, which was used in the dialogue user testing (see section blah).

A key advantage of using Yarn with Unity is the capability to create C# and yarn scripts which can communicate with one another and trigger events.

An example of this is the functionality have future dialogue informed by previous conversations with characters, which is controlled by the Interactable.cs and the YarnManager.cs scripts.

Text

Description automatically generated

A new command handler is added to the dialogueRunner by the YarnManager with the yarn command advanceEntryNode, which references the C# function AdvanceEntryNode(). The AdvanceEntryNode() function takes in the name of the new node as a string, and passes it through to the current interactable so it knows what node should be opened when a player starts dialogue with them.

With the new yarn command advanceEntryNode, the node can be advanced from a specific line in the yarn script.

Text

Description automatically generated

This means that as players interact with characters in the world and return to them, the characters dialogue and writing can change to progress the story forward rather than starting from the beginning every time.

#### Fog of war using Marching Squares

The Marching Squares algorithm is applied to create a system whereby the player explores an area to reveal corresponding areas of a mini map. Based on which vertices on a grid are on or off, a case is identified, and the corresponding square image is displayed in that tile. Using Marching Squares to achieve this fog of war effect on the map is an efficient way of checking the players world location and updating the map visuals accordingly without manually setting each individual pixel.

Calendar

Description automatically generateds

Figure 1 - The Marching Squares cases

All of the operations involved in the implementation of Marching Squares is controlled from the MarchingManager.cs class, which is attached to a GameObject in the relevant scene. The custom classes Square.cs and Vertex.cs represent the vertices and squares that make up the grid used for Marching Square calculations.

The Square.cs class contains a list of the four vertices associated with the Square, a conversion list used to convert vertices info into Marching Squares references, a reference to the Marching Manager in the scene, and a Vector3Int containing the Squares position.

It has two functions. OnVertexUpdated() is called by the vertex script and checks the state of each vertex attached to the square, converts the values into a reference number between 0 and 15 which refers to a Marching Squares image.

The updateTileSprite() function takes in the new Marching Squares reference number and updates the current tile accordingly.

The Vertex.cs class contains a list of the squares it’s associated with, a bool for current state named isOn, and a Vector3Int position.

It’s only function is IsOn() getter/setter. The get function returns the value of isOn. The set function is called by the MarchingManager.cs script when player movement triggers a new vertex to be turned on, and calls OnVertexUpdated on each of it’s associated Squares.

On Start, MarchingManager.cs uses a provided tilemap to create a 2d array of squares based on the bounds of the drawn map. This allows the developer to draw any tilemap before runtime and have it automatically acknowledged and converted to the array which can be accessed by other scripts.

Then the script creates corresponding 2d array of the vertices from the squares array, applying offsets to each of the square positions to find the four corners of each square.

On Update, MarchingManager.cs gets the player position in world space, uses the helper function translatePlayerPosToTilemap() to translate it to a Vector3Int position on the tilemap, and calls turnVertexOn() on the vertex at that position on the tilemap.

In the product, this is used to create a fog of war effect over a mini map in the corner of the screen when exploring the forest. The Marching Squares sprites are varying proportions of opaque white and transparency. As the player explores, more of the tilemap becomes transparent, revealing the hand drawn map asset on the layer behind.

## 6 - Legal, social, ethical and professional issues

### 6.1 Data Collection

User testing and surveys throughout the project involve collecting data from users. To ensure this doesn’t infringe on their right to privacy, each survey was prefaced by a written disclaimer explaining why the survey is being conducted, how results will be used, guaranteeing anonymity of respondents and explaining how to contact the researcher for more information or to withdraw responses. To continue to the questions, users had to read the statement and tick a box confirming their understanding.

Some of the subject matter of the data collection included sensitive subjects such as demographic information and asking respondents about their mental health history. Every question was marked as optional to ensure that no respondents were forced to share information they’d rather keep private.

### 6.2 Mental health content

The project is based on using serious games to improve mental wellbeing. As part of this, the game both represents mental illness in characters, and suggests habits and techniques to improve mental health.

Poor representation of mental illness in characters could be a social issue, causing distress for users who suffer from similar issues. To ensure accurate representation, online accounts of depression and anxiety were used as reference. Care is taken to not go into detail of symptoms or actions which could trigger users, and instead the focus is on identifying commonly experienced feelings such as low-mood and nervousness.

In trying to improve mental wellbeing, it’s important to not dismiss people who struggle with their wellbeing, or to be put in a situation where players rely purely on the game as a source of information rather than seeking out psychological support. To prevent this, care is taken in the dialogue to present the habits and techniques as suggestions only which may soothe symptoms, rather than cures which claim to ‘cure’ mental illness. A disclaimer is displayed at the start of the game, accessible from the menu, and featured in the end credits. This explains that the product is intended to be a helpful resource rather than a replacement for professional help and encourages users who relate to problems represented to seek support from Mind UK or their GP.

### 6.3 Foraging content

In demonstrating the act of doing activities in nature, the game discusses and portrays characters foraging for food in the woodlands.

This could have serious consequences if users go on to forage themselves and either eat poisonous food or trespass and forage illegally on privately owned land.

To prevent users eating dangerous food, the characters discuss using a guidebook to help identify food that is safe to eat. This is translated into the mechanic which highlights edible food in the woodland scene, labelling the plants with their name. All plants referenced are safe to eat and legal to forage in the UK. Additionally, a disclaimer about eating food from the wild is displayed at the start of the game, from the menu, and in the end credits, explaining the importance of correct identification and providing resources to allow players to forage safely if so wish.

In the UK, the Countryside act allows people to forage for private consumption on common land. It stresses the importance of gaining landowners permission to gather on privately owned spaces, and encourages foragers to gather respectfully, leaving enough of resources for other people and wildlife.

The game content follows and references the Countryside Act. The woodland the characters explore and forage in is visibly labelled as ‘common land – foraging welcome’ to show demonstrate permission. When the player first learns about foraging from the non-player character, they discuss the legality of foraging and the Countryside act before continuing. Links to resources on foraging legally in the UK are provided with the disclaimers in the start, menu option, and end credits.

## 7 - End-project report

## 8 - Project reflections

## 9 - Conclusions

## Reference list and bibliography