MAP QUEST

Explore the City, Piece by Piece

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The problem

People with autism face unique challenges in urban spaces due to the design of these spaces not being inclusive towards their needs. Many users we interviewed did not enjoy public spaces and actively avoided them - crowded and noisy environments discouraged users from exploring as well as difficulties with finding friends who wanted to do the same things.

User Research

4x
More likely to be lonely if you're autistic [1]

90%
of people with autism process **sensory information differently [2]**

Up to **80%**
of people with autism suffer from **executive function disorder [3]**

over **75%**
of people with autism have at least one special interest [4]

Primary research

7 Participants | **18-20 years old** | **Scoring > 65 on RAADS-r test** | **Living in cities**

Test used as a part of the diagnosis process of ASD in adults, designed for higher functioning individuals.

Test of choice for researchers with Specificity of **100%** and sensitivity of **97%** , making it **reliable** for screening with **no false positives**. [5]

Using RAADS-r tests we were able to include people in our research who don't have a formal diagnosis of ASD

More opportunities for different types of public spaces we could explore

More overstimulating environments

Interview

Questions focused on exploring public spaces, social interactions, and pain points, allowing us to find out what people say they do and help with the diary.

Key takes:
- The main issues people had were around transportation
- People wanted to go out and explore but they don't know where or who to go with

Diary

Interviewees made note of when and why they went to public locations and the emotions they felt as well as if things went to plan to give us an idea of what they usually do.

Key takes:
- Most of the people we interviewed had fixed behaviours and followed a regular routine throughout the week
- A lot of people didn't go out often

Re-interview

Helped us see the **difference between what they do and say they do** and see if their answers have changed from the initial interview

Key takes:
- There were no significant changes in the answers
- People were very consistent about their problems

Key insights

Transportation — Crowds and loud noises make transportation unpleasant which leads to people inconveniencing themselves to avoid them

Judgement — In unfamiliar environments, people often feel judged by strangers, especially when alone

New environments — New environments can be challenging due to their unpredictability which can be confusing, distressing and overwhelming.

Executive dysfunction — Makes it harder to maintain relationships and engage in social interactions

Social interactions — People diagnosed with autism can find spending time with their neurotypical friends difficult due to different special interests and social needs (e.g. parallel play)

User Needs :
- Personal space/ boundaries
- Reduce incoherent stimuli
- Collect objects of interest
- Reducing boredom
- Seeking stimuli
- Sense of belonging/ community
- Avoid judgement from peers
- Meaningful discussions in small groups

HMW

How might we support autistic individuals to confidently explore urban settings to fulfill their social and sensory needs?

Personas and their barriers

Alice

Alice **goes to public spaces with friends** but is often **overstimulated, overwhelmed and exhausted** by sensory issues in those locations.

Barriers
1. Unpredictable environments
2. Overstimulating environments
3. Isolation from turning down invitations/ being overwhelmed

Queen of hearts

The Queen of Hearts wants to **go to places relating to their specific, special interests** but cannot find people to share them with.

Barriers
1. Double empathy problem
2. Restricting interests
3. Overstimulating environment

White Rabbit

Although the White Rabbit **wants to explore public spaces to fulfill sensory needs,** they are **limited by a lack of time as a result of executive dysfunction**.

Barriers
1. Executive dysfunction
2. Can't put time into socialising
3. Overstimulating environments

Non Users

Non users may not face the same challenges in public spaces and often have **different interests when exploring a city**, making it **harder to find shared experiences** with autistic users when exploring the city.

Ideation

How might we support autistic individuals to confidently explore urban settings to fulfill their social and sensory needs?

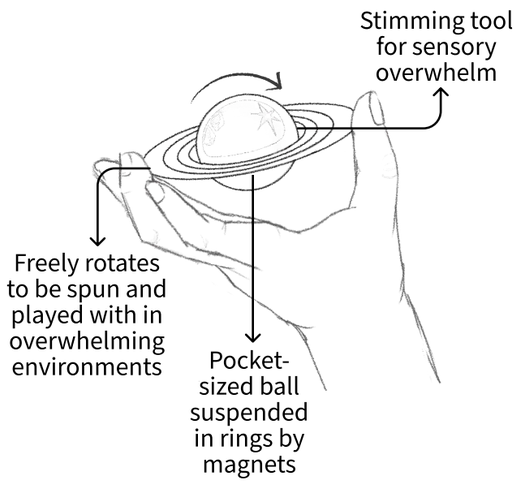
Idea Generation

We considered every part of the timeline leading up to exploration including getting ready to leave

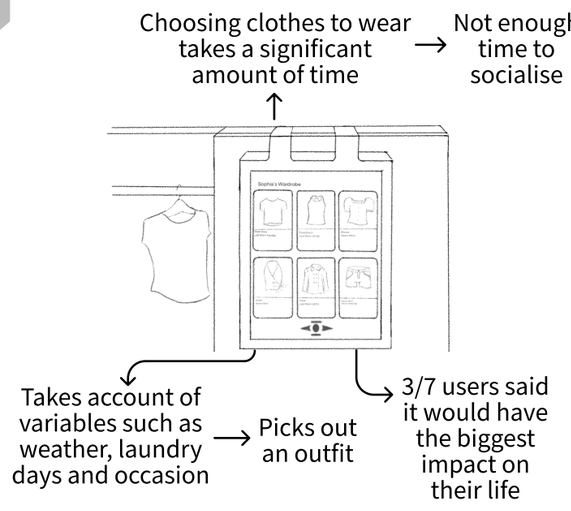
Our ideas mainly focused on :

- Helping with executive dysfunction
- Stimming tools to help with sensory overwhelm
- Supporting the creation of communities between different people and initiating social interactions

Saturn Spinner



Garment selector



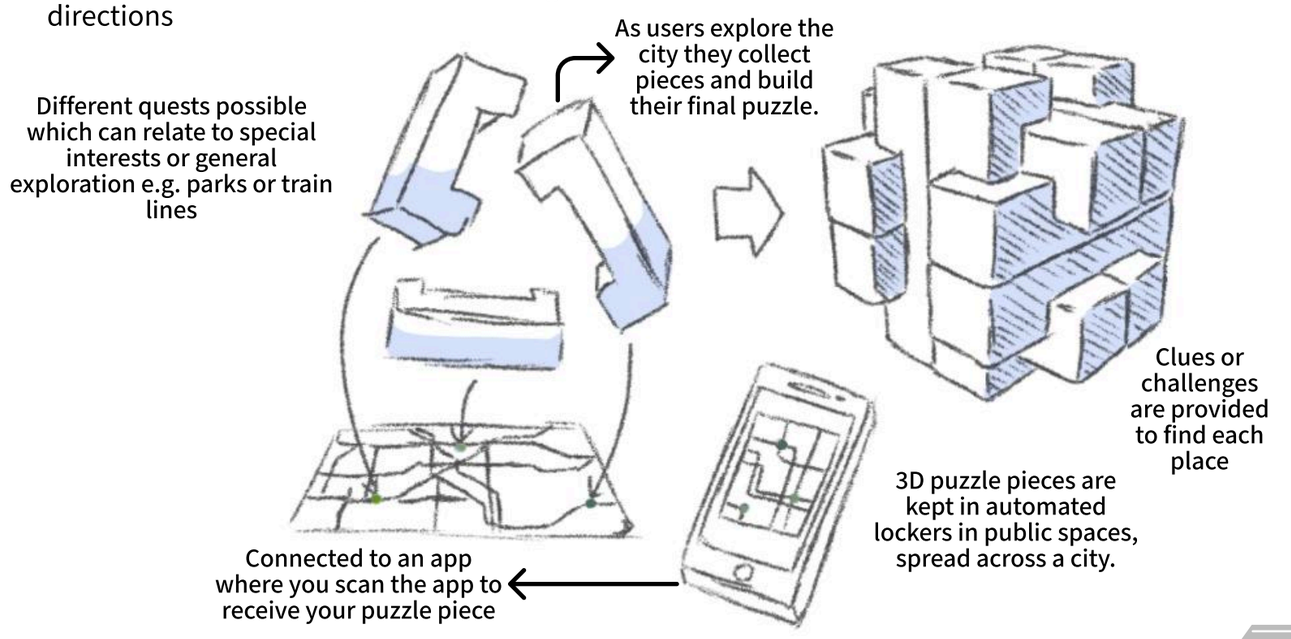
Map Quest

We picked this idea out of the three for multiple reasons:

- Most directly encourages exploration of urban spaces
- Highest quality-biased rank out of all ideas by users
- Most potential for development in a range of directions

4/7 users chose it as their favourite out of 15 designs

> This is something which excites me and I would definitely do it if it were real.



How does it specifically help people with autism?

Relevance ↓

Overcoming Executive Dysfunction	Acts as a **framework to explore** by making it less daunting and more structured **reducing effects of executive dysfunction**	• Up to **80%** of those with ASD experience executive dysfunction [3] • Improves with: support for emotional regulation and task organization
Incentivise Exploration	Many users found they **avoided going into public spaces unless they had a reason** due to the many uncomfortable aspects	From our primary research, **5 out of 7** participants **only went out to fulfil their commitments** i.e. going in to university/job.
Accommodating Special Interests	Accommodates for varying **specific interests** between different people by **giving people an incentive to go to places they may not be as interested in**. Since one of the main problems was not having people to explore with, this alleviates that problem.	Many with ASD have strong fixations, with **75%** of youth having **at least one special interest** and **half of those** having two or more. [4]
Appealing to collectors	Many people with autism **enjoy collecting things** and the Map Quest uses this to **encourage exploration**.	From the interviews we conducted we found out that **4 of the 7 participants** enjoyed collecting items relating to their interests

Prototyping Priorities

Due to the time constraints of the module we have decided to prioritise the components to prototype in the order below:

1) Design of quest structure

Making each quest engaging and an activity people would repeatedly do is the most important part of the game

2) App

The app would be the main product of the game as it would be the way you collect information to encourage you to explore

3) Physical puzzle

The physical puzzle acts as a prize and incentive for people to explore which is an important aspect to the game but would change for each quest so is less important.

4) Dispensers

The dispensers are not a necessary aspect to prototype as we could use existing products such as lockers to distribute the puzzle or use local businesses as a way to foster community and they do not have a significant impact on the user experience.

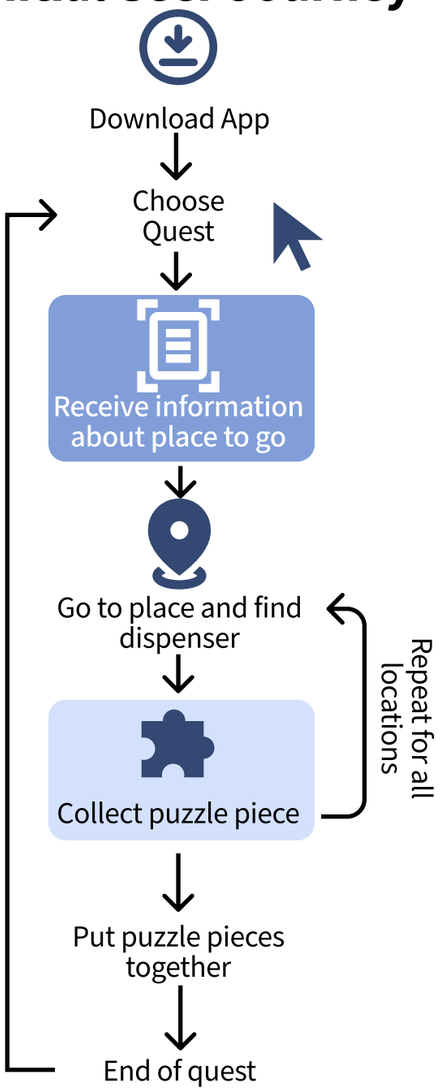
Appealing to a diverse audience

The game is designed to **appeal to a diverse audience**. A wide range allows people with ASD to **explore alongside friends** who have different interests or who are neurotypical, **creating shared experiences** that may not happen in traditional settings.

By **using gamification as common ground** the game **helps reduce social barriers** allowing people with ASD to connect and enjoy **meaningful interactions on their terms**

Testing Assumptions

Initial User Journey



Priorities

- ☐ **Safety**
  Are there any risks involved in playing the game e.g. meeting strangers?
- ☐ **Engagement**
  Are people engaged with both the game and the places within it while playing?
- ☐ **Satisfaction**
  Do users feel a sense of achievement having finished the game?
- ☐ **Accessibility**
  Can users adapt the game to suit their needs and preferences?

Preferred Option	Feedback	Key takeaways and next steps

Assumption 1 : Users prefer learning the places to go to in order over all at once

Preferred Option	Feedback	Key takeaways and next steps
Iteration 1) Gave all the clues at the beginning so users could choose the order (unordered) **Iteration 2)**Clues were given one at a time after they visited each location (ordered)	• In general people preferred having the clues given to them in order because it reduced the decisions they had to make • "I would want the locations to be given one by one, if they were all given at once it would be overwhelming" • "It would be nice, if the locations were less well known"	• **The quest should be ordered and you only get the next clue after going to each place - to reduce decision fatigue** • **Have the locations be more niche/less well known**

Assumption 2: Solving puzzles facilitates social interactions within a group

Preferred Option	Feedback	Key takeaways and next steps
Iteration 1) Location given with no puzzle **Iteration 2)** Given a puzzle to solve for the location	• People would work together to solve the puzzles especially when they were difficult • They enjoyed solving the puzzles as a group	• **Have more features for group quest that increase social interactions**

Assumption 1 : Solving puzzles or clues to find the places to go to increases engagement with game

Preferred Option	Feedback	Key takeaways and next steps
Iteration 1) No puzzle/clues **Iteration 2)** Radius given with the location somewhere within **Iteration 3)** Other types of clues, the logic of which is shown on the right	• All users liked the idea of solving puzzles and didn't like being given the exact location • **5/10** people wanted them to be harder • Some felt there was a disconnect between solving the puzzles to get the location and exploring	• **People preferred having clues to reveal the locations** • **The types of clues used didn't matter to our participants** • **people enjoyed having harder puzzles to solve**

Assumption 4: Following a narrative increases engagement

Preferred Option	Feedback	Key takeaways and next steps
Iteration 1) Given puzzles/clues only **Iteration 2)** The clues were part of a wider narrative/storyline	• **7/10** users enjoyed following a storyline as the way to get the clues • Some users felt there was more connection between the places and the puzzle through following a storyline • Some users wanted the story to be more personalised	• **There should be a storyline/ narrative that connects the places to the clues given to decrease the disconnect at each step**

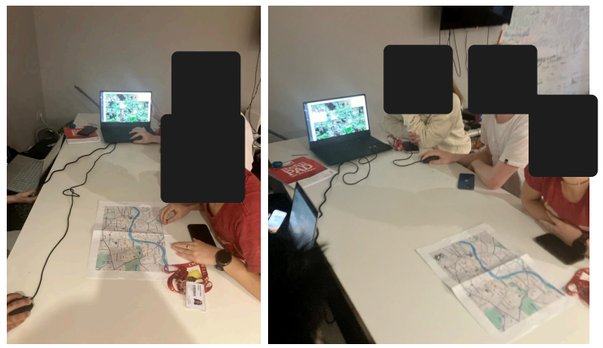
Assumption 5 : Collecting physical puzzle pieces increases satisfaction with the game

Preferred Option	Feedback	Key takeaways and next steps
Iteration 1) Given a puzzle piece after going to each location **Iteration 2)** Not having a reward	• All users preferred having a puzzle over not having a reward • **2/10** people found that the puzzle wasn't a strong enough motivator and would only be motivated by free food/money	• **Collecting a physical puzzle as a prize from each location can act as a sufficient motivator to explore**

Co-design session

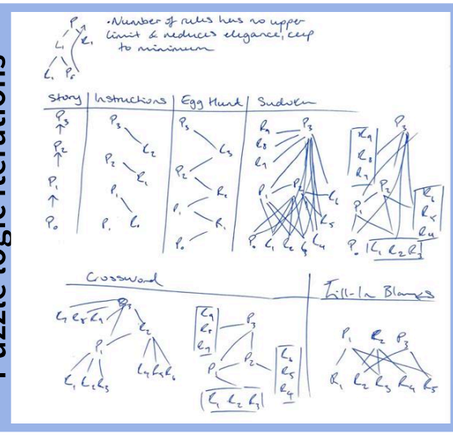
We created five hypotheses based off of the user journey and used **AB testing and a Wizard of Oz** prototype to test our assumptions.

For **every prototype** we decided to **design the quest around nature** as it was a common interest between a majority of the people we interviewed



We carried out our user testing with **two focus groups made of the people we initially interviewed** and their friends. We used a map of London and figurines to move around in order to **test the game mechanics** and more specific aspects for which the travelling element was not necessary.

Puzzle logic Iterations



P - Piece
R - Rule

Shows the hierarchy of amount of info required and the different paths of a quest

(read from bottom to top)

Safety considerations

- The games **function** is **not to help people make friends online** as it might **pose a safety risk** to meet up with strangers to complete the quest
- To ensure **safe navigation in the city**, the game will **not include any features that require players to look at their phones while walking** to avoid problems raised by apps such as Pokemon Go.

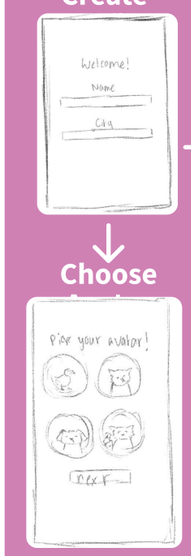
Refining systems

Based on the initial feedback we focused on refining the game system design and user experience to **accommodate for a range of players** by **maximising satisfaction and engagement while reducing decision fatigue.**
The **purpose of the app is not to meet new people** both for **safety considerations** and due to the overwhelming user feedback **disliking seemingly artificial connections.**

Single vs Multiplayer - Adaptability

We added an option to play as a single player or as a group because during our tests people had **different preferences**.
Having this option allows for the player to **choose if they use the app just to explore or also to socialise with friends.**

Download the app → Create → Choose → Choose → Filter Quest → Location / Interest → Single or Multiplayer → Single / Multiplayer → Create Party and Invite Friends → Given Part of Story → Given clue to continue narrative → Solve puzzle to find location → Input location guess → Location Correct? → Yes / No → Answer/hint → Go to location from the clue and collect jigsaw → Scan jigsaw piece in app → Jigsaw Complete? → Yes / No → Receive Digital Reward



Hints and Answers - Adaptability

We made **inputting the guess** of the location **optional** and added a hints function to **accommodate for the different preferences of game play**

Ordered clues and storyline - Engagement

We responded to feedback by adding in a story element to the user journey. The **clues are now incorporated into the story** to make them seem more **intertwined with the locations and journey, decreasing the disconnect between the actions**. This also means that the clues are ordered which **reduces decision fatigue.**

Digital rewards - Engagement

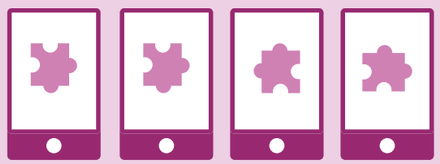
We decided to add a **digital reward at the end of a quest in the form of accessories** for the players avatar as way to **personalise the experience** and **act as a motivator** to continue using the app to explore a city

Example :



Clues in multiplayer mode

- **To increase social interaction** when playing with a group we decided to split the clues between each player's phone so that they would have to **work collaboratively to piece the information together.**
- This would also **add another layer of difficulty**.



Key considerations for our target group

- Having an **ordered quest and giving clues one at a time** to **reduce the decision fatigue**
- **Accommodating for different people's preferences** by having multiple ways to play

Clue Types

From our user testing we found that the **type of clue mattered less to people than how it fit into a given narrative** . So we developed/expanded on **4 types of clues** that would be given in a quest that would **work well in any narrative**.

Clue Type / **Example within story**

Providing a Radius

Giving a circle on the map for users to search within.



"The most recent phone call was within 100m of the Lancaster Gate cell tower."

Anagram

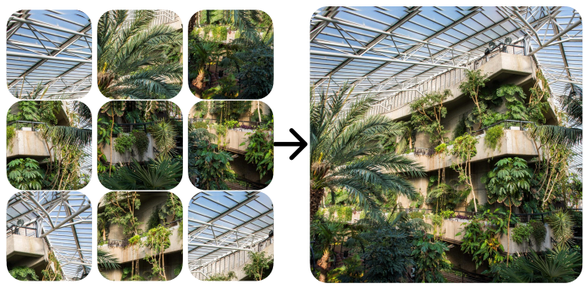
Letters of the place name are rearranged, user must put them in correct order.

You find a meeting in a calendar with 'P.H Daryke' and no location.

Hyde Park
↓
P.H. Daryke

Rearranging a Photo

A photo file is corrupted or a photo is torn up and you must rearrange to find the place.



Traditional Clues

Finding hidden notes or talking to witnesses who may have seen things to receive clues either as riddles or just clues about the location.

This place sits in the heart of the capital,
Once a royal hunting ground, now a public jewel."
"Where anyone can stand and speak their mind,
At a corner known for debates of every kind."
"Covering over 350 acres of green,
It borders Kensington Gardens and the Serpentine in between."

PHYSICAL PUZZLE PROTOTYPING

Reasons for having a physical puzzle

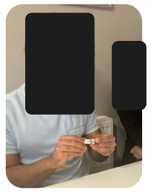
- Research shows that there is a **strong correlation between in game rewards and player engagement**, having a physical puzzle **adds diversity to the games rewards** [7]
- From **user testing** we found that getting the **puzzle increases player satisfaction**
- Allows us to **incorporate collecting items into the game** which was something many of our **interviewees enjoyed**.

Lofi modelling → We tested different types of puzzles to see how the users interacted with each one and what people liked to have in a puzzle



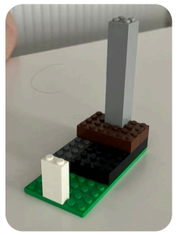

Traditional Jigsaw

- Could be made in a range of shapes for each quest
- Quick and easy with minimal pieces
- Could not be displayed easily since 2D

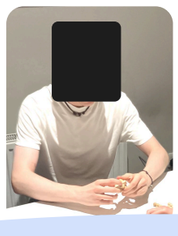
Slot together Puzzle

- “I think I would want to keep it the most”
- “It’s fun to put together and not too difficult”




Puzzle with no fixed solution

- Prototyped using lego
- “I like how you can be more creative”
- “I would be unlikely to keep the final thing I make”

3D brain teasers

- People enjoyed trying to figure out how to solve the puzzles
- Nobody managed to finish a puzzle completely before giving up - not as satisfying

Key takeaways

- **People liked interacting with 3D puzzles more than 2D jigsaws**
- **People liked the idea of being able to use the puzzle as a fidget**
- **People liked how the puzzles had the same theme as the quest and the idea of being able to display the puzzle**

Further development

From our feedback we decided to develop different 3D puzzles and incorporate aspects that would be fun to fidget with

Requirements :

- The puzzle should **relate to the interest of the quest**
- The puzzle should have at least **as many pieces as there are locations**
- The puzzles should **take some thought to put together**

Idea generation



Petals on flower provide lots of different opportunities for fidgets



Stem can be moved around Leaves wrap and unwrap

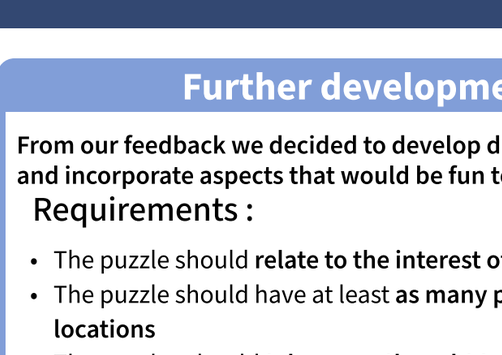


Moving wings and legs on a bird Parts of the bird as individual pieces seems “creepy”



Stress-ball-like top Less related to locations

Prototyping fidget mechanisms

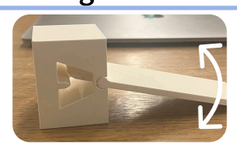


Ideating different degrees of freedom to create moving puzzles which can be used as fidget toys.

By combining different ranges of motion puzzles a huge range of fidgets could be created for each quest

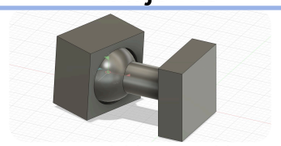
We chose 2 mechanisms to model using CAD to see how they could be used in our prototype

Clicking mechanism



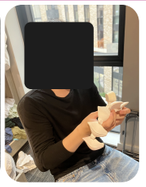
- Clicks between two positions making a noise
- Moves around one axis
- Aesthetically pleasing for a flower since it can be open or closed like a real flower opening up.

Ball joints



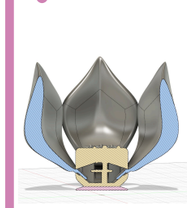
- Could be used in many different parts of a puzzle
- Clicks together satisfyingly
- Can move around all three axes which may be more fun to play with

Hi-fi prototype


- **Petals connect together at the centre with ball joints**
- 3D printed in PLA as individual components
- Pieces successfully click together
- **Overwhelmingly positive user feedback**, users really enjoyed winding the petals together
- Needed a small amount of post-processing, sanding down parts and building onto one ball due to high tolerance of 3D printer

> I would definitely like to have something like this



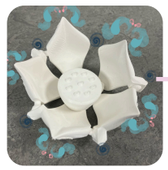


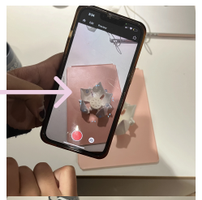
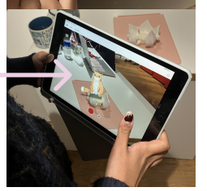
- Lotus **spins around dowel** which goes through the core and a base piece
- **Petals click between two positions** - parts shortened to move more easily than previous prototype but they didn’t fit into the core very well and fell out easily
- Flower core printed as two parts to accommodate hollow areas
- **Petals printed separately to be used as puzzle pieces**
- The flower was printed scaled up to more easily see and test parts
- Although users enjoyed the spinning in user testing, **the clicking petals were much less popular**

> It’s quite fun but the motion is not as satisfying

Augmented Reality

As a type of digital reward linked with the app we explored the idea of AR when the puzzle is put together



We **created a 2D animation** on procreate and **exported** each frame as a PNG in **Adobe Aero** and **anchored it to the prototype**. We created an action that allowed the **animation to play** when you **pressed the trigger** .

We prototyped 2 versions to see what would act as a better motivator to do new quest:

- Using an intricate pattern
- Using the avatar

From research and speaking to users we found out **seeing the avatar helped them identify with the quest process** and acted as **more of a motivator** to complete new quest [6]

> The animation is cute but it’s nicer if the the AR was more related to the quest

Improvements:

Having the animation of the avatar be more explicitly linked to exploring and the quest to identify with the avatar more

APP PROTOTYPING

Concept Development

Themes

Most → Favourite → Least



From our feedback the city concept was the favourite as it fit the concept of the game the best

Colour scheme



Main colour scheme
- monochromatic colours to not be visually overwhelming
- blues associated with calm

Accent colours
- helps key information stand out
- contrasting colours to main colour scheme

Fonts

Maiden Orange
- Cute and playful
- Close together letters may be hard to read
- No variation options in line weight
- Serif fonts are more difficult to read on screens

Madimi One
- Easy to read
- Rounded letters fit app aesthetic
- No variation options in line weight

Darker Grotesque
- Sans serif fonts for better readability on a screen
- Many options for line-weight variations
- Fits with chosen theme

Icons

Functional



- Reducing need for text
- Widely understood and used icons
- Setting, home, location and menu

Aesthetic



- Quest themes are quickly identifiable
- Adds a playful element

Illustrations

MOPQUEST

The logo incorporates symbols that represent the game

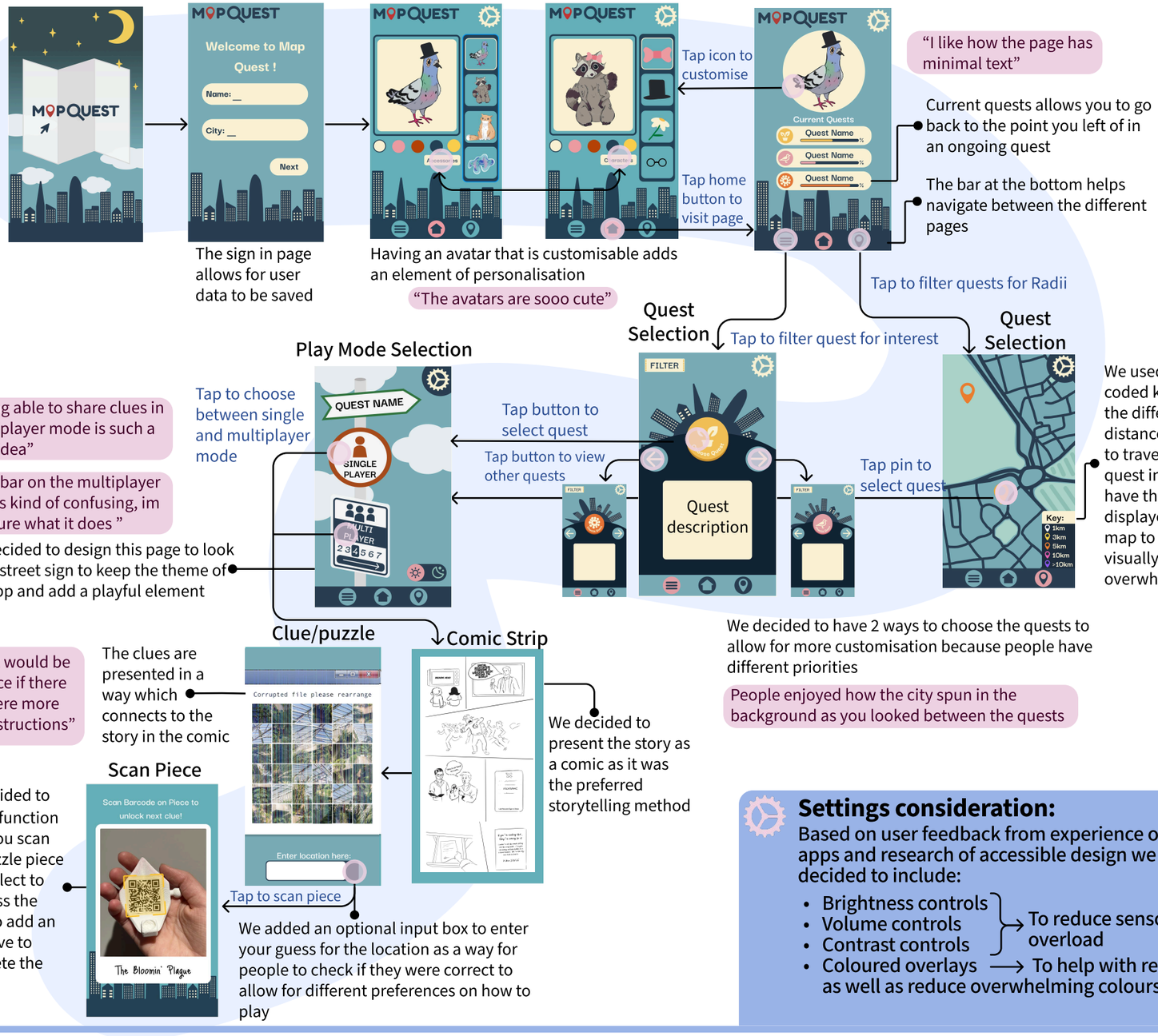


We decided to go with creatures found in cities for each avatar

The avatars add an element of whimsy to the app and is away to personalise the experience to each user

App flow

We designed the apps aesthetics in figma and then exported the frames to use along with the code to make an app



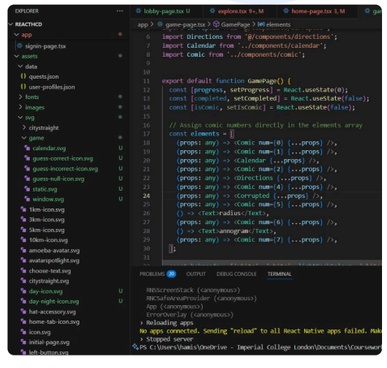
Settings consideration:

Based on user feedback from experience of using apps and research of accessible design we decided to include:

- Brightness controls
- Volume controls
- Contrast controls

→ To reduce sensory overload

- Coloured overlays → To help with readability as well as reduce overwhelming colours



From Figma to app

1) Tech stack:
- tried C# MAUI+XAML MVVM, Uno (C# MAUI+XAML MVUX) and React Native simultaneously on until something worked on android, ios and web with the figma code plugins.
- No need for node/next/vercel since react native was working.
- no need for backend since we don't really have a real database

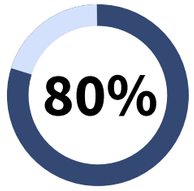
2) Assets:
- plugins were either paid or bad quality
- exported each group into SVGs (vectors are scalable), and used a react native svg package with polymorphism
- effective but time consuming

3) Architecture:
- simple MVC with view in the same file as the controllers because of the way react works

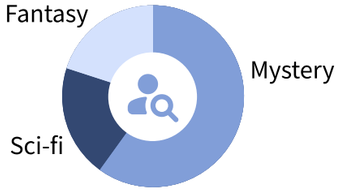
4) Linking methods:
- stacks for sequential routing for the signin page
- storing user profiles in a json and used unencrypted AsyncStorage to store variables in RAM between pages/scopes
- Tab system for the main console of the app
- Game page imported components into a list and iterated through to progress through the game.

STORYLINE

We asked **30 people aged 18-21** about their **preferences in narratives** to ensure that our storyline would be **engaging**



of users said they would prefer fiction to non-fiction stories



The mystery genre was the most popular

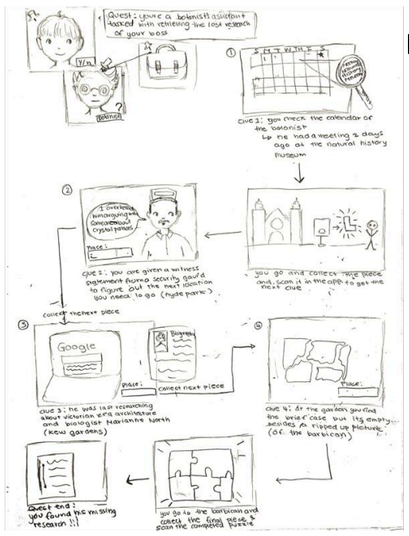
"Fantasy could easily be quite childish"

7 Plotlines

Most Popular

- The Quest
- Voyage and Return
- Overcoming the Monster
- Rags to Riches
- Rebirth
- Tragedy
- Comedy

Least Popular



How should a story be presented?

- **AB testing** with a comic against a written story
- **The comic was significantly more popular**

> I would be much more engaged with a comic

> I would enjoy reading a comic a lot more

- We **iterated** by **incorporating the clues into comic strips**, clicking on parts of the comic strips to get to the clues so they feel integrated into the app
- e.g. a folder on a laptop in the comic could be clicked on to reveal a clue

Morphological Analysis of Story Concepts

Protagonist	Plotline Type	Conflict	Resolution
Scientist	Voyage and Return	Betrayal by a Mentor	Personal Sacrifice
School child	Quest	Missing Person	Villain becomes ally
Police Officer	Overcoming the Monster	Finding identity	Pyrrhic Victory
Animal	Rags to Riches	Bullies	Truth Revealed

Using a large language model to facilitate the generation of stories

We'll use large language models (LLMs) alongside a retrieval-augmented generation (RAG) system to **break stories down into modular, flexible text components.** These components can then be mapped in a way that allows us to understand their themes and meanings.

By doing this, we can adapt and **reshape stories in real-time to match a user's specific interests,** such as their special interest. Ensuring each narrative feels **personally engaging and relevant.**

The use of AI is **only a step in generating each story to increase the customisability** of each story to the user rather than generating every aspect of the story.

Involving the wider community

For a full scale product, users will be able to **submit places they like along with stories and facts** about the place, these suggestions will be used to **inspire new quests** and storylines.

This approach means that the quests would be **influenced and shaped by the users of the games**, creating experiences that **reflect the identity of local communities** and encouraging deeper enjoyment and long-term engagement.

We would also **aim to work with local businesses** such as independent cafés and shops to **share their stories**, increase public interest, and boost footfall, helping to **support and connect thriving communities.**

Crucially, we will prioritise and **platform neurodiverse voices**, particularly individuals with ASD, to help **shape the product in ways that support their needs**. This ensures that the game remains **accessible, inclusive, and beneficial to a broader range of users**, especially those who are often overlooked in traditional design processes.

Example Quest : The bloom'in Plague

Plot synopsis:

"When your mentor vanishes, leaving behind only a cryptic note and a trail of clues, you must retrace his final steps through London's gardens and woods. As a mysterious illness erases people's sense of direction, the key to the cure—a rare flower—lies hidden. Find the bloom. Trust no one. Time is running out."

> It's an interesting premise, it would be nice if there was more exposition on the comics to explain what's happening more clearly

Comic panels : The bloom'in plague



MOPQUEST

Explore the City, Piece by Piece

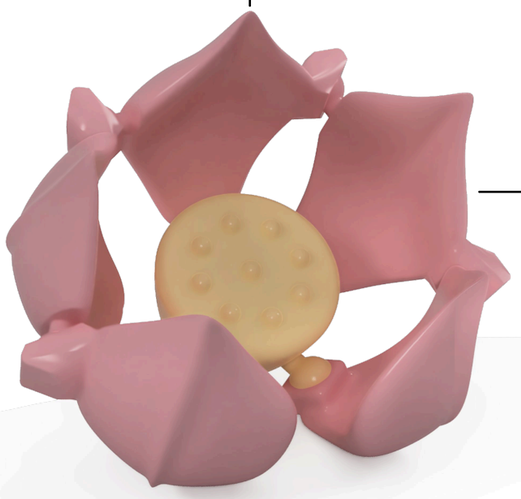
Designed for ASD

Specific Interests
Allows users to discover places related to specific interests

Decision Fatigue
Reduces decision-making required for exploration with guided series of destinations



Augmented Reality
Scan your finished puzzle into the app to trigger a playful animation



Choose a Quest
Pick between hundreds of potential stories related to different interests

Follow a Story
Read through a series of comic strips intertwined with clues and puzzles which lead you around your city



Assemble a Fidget
Collect puzzle pieces at each location in a quest, these can be assembled at the end to create a fidget toy related to your interest

Explore the Area
Discover hidden places around your city as you complete each quest



Have fun with friends or alone
With both single and multiplayer options, solve clues to find each location either collaboratively or solo depending on preferences



Pick and customise your Avatar
Earn a range of accessories after completing quests to personalise your character





APPENDIX

Meeting Minutes https://www.notion.so/1e9887dac26a80e393d2c5a0cac26076?v=1e9887dac26a80abb134000cc518667d&source=copy_link

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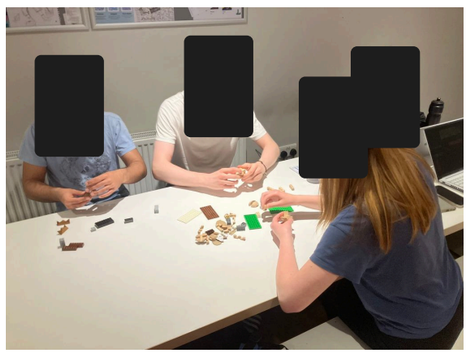
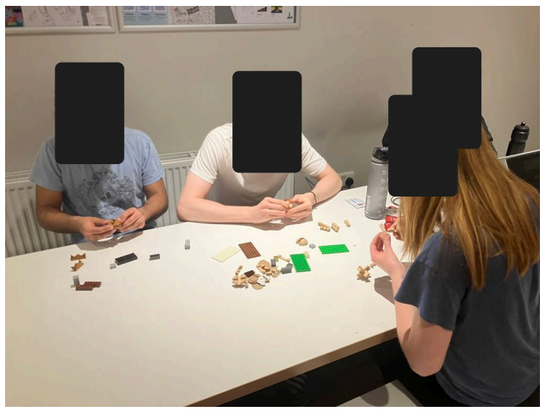
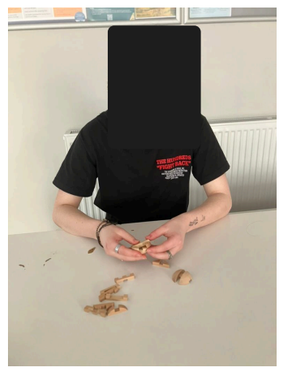
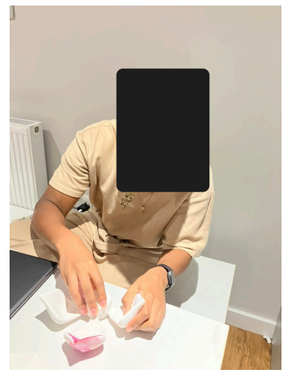
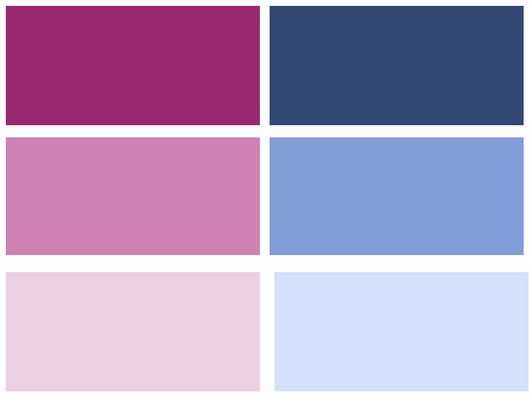




Report Design

Mada Mada Mada



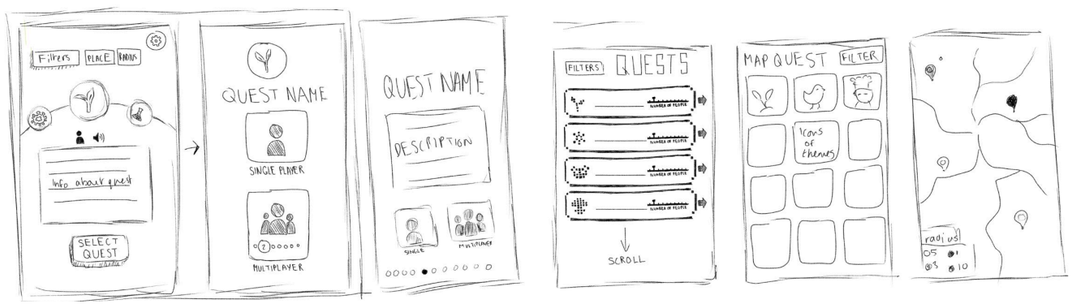


Icons used throughout for clearer communication.

We decided to design each page with alternating pink and blue, using the colour which wasn't the main one to draw attention to the points we wanted readers to take from each page

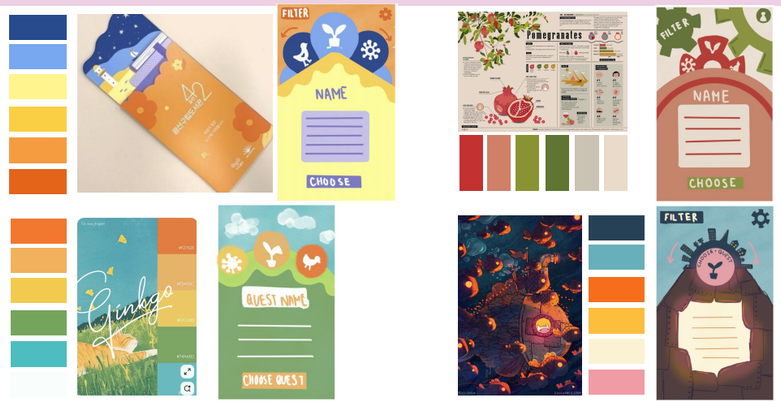
App Design

Initial design sketches



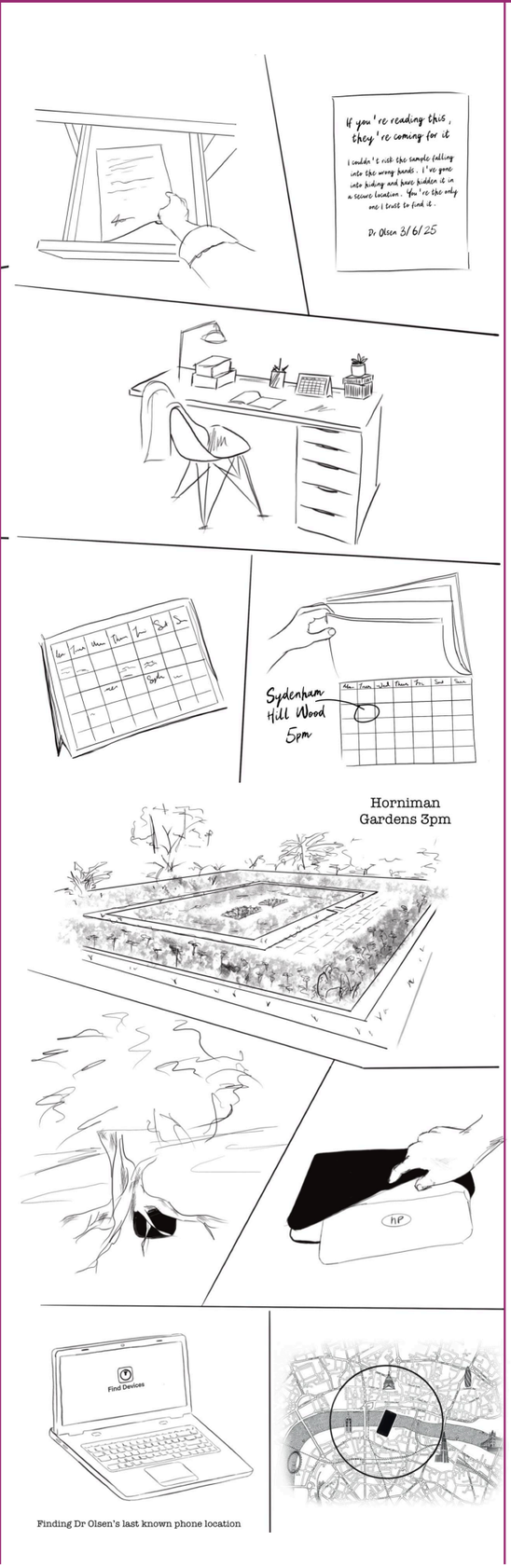
Full Figma Prototype - https://www.figma.com/proto/8yYFtP3UENvAFDUnSu1SX2/Summerterm?node-id=433-35&t=Zpm1dk4nHSeLNznQ-1

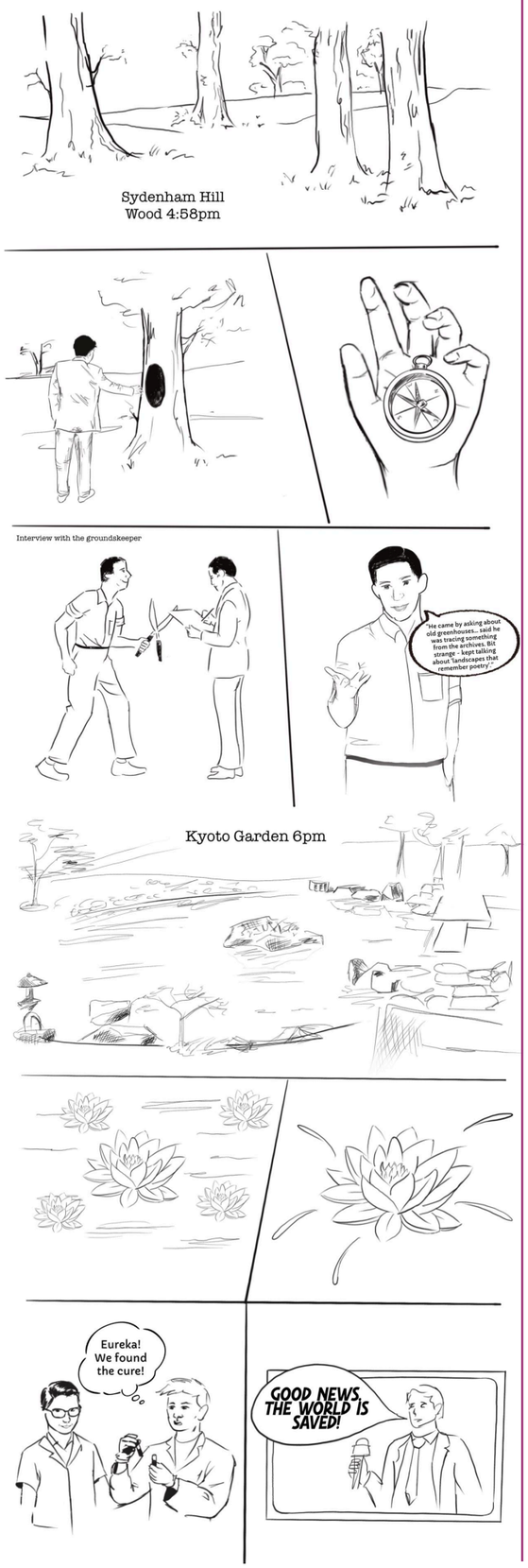
Colour scheme inspiration for app designs



Supplementary: Comic Strips Leading To Locations









Github repository of full app code

https://github.com/ZX-dev545/ReactHCD