



New World Explorer

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World Explorer was the initial concept of the game created during Research and Ideation. The finished product was a development of this game, figuring out how to bring it into the 21st century and find a way to give the parents the required information in a way that did not require them to sit and watch every move the children made in the game and interpret it themselves. Originally the game was a more traditional board game, however, by incorporating a screening test made possible by the emerging hybrid game segment has transformed the original game into a novel concept.



Image 1: Scan of original concept that below P.D.S. is in reference to.

Usable

1. The physical board game and app must each be set up and ready to be played in 4-6 minutes (assuming the app is already downloaded).

1.a. According to studies, by the age of 5 a child can stay engaged for 4-6 minutes on a single task (Speech Therapy Centres of Canada, 2013), therefore setting up the board and the app should not take longer than 8-12 minutes, as if it takes too long the user may become frustrated and bored and give up on the game. 'It is important to find a balance between reducing the steps to improve efficiency and adding steps to allow for sufficient explanation of an infrequent task' (BS EN ISO 9241-171:2008).

2. The game must be portable for a child aged 5-7 years old.

2.a. The youngest intended user is a 5 year old so therefore the product must be of suitable dimensions for them to be able to retrieve, unpack, set up, play and put away.

3. Each of the player pieces must be easily distinguishable.

3.a. Unique combination of form and colour allows for players' pieces to be easily distinguishable, 'principles of colour theory can be applied successfully to characters and objects in game design to generate preferences towards some objects' (Lambrant, Luro and Sundstedt, 2015).

4. The font size used for a viewing distance of 500mm should not be smaller than 8 pt on the app (BS EN ISO 9241-303:2011).

4.a. Fonts at a viewing distance of 500mm should be no smaller than 8 pts as specified in (ISO 9241-303:2011).

5. The iconography in the app should be clear and recognisable in less than 5 seconds by a test sample of 5 users.

5.a. Iconography is a simplified way to communicate with young children whose reading skills might not be that good yet. A study by the Nielson and Norman Foundation (A. Harley, 2014) recommends that users should be able to recognise the meaning of iconography in less than 5 seconds.

Useful

6. The size of the player pieces must be between 0.6 cm to 4.7 cm for ease of grip for children (5-7 years old).

6.a. According to anthropometric hand size data the player pieces should be this size to ensure they are easy enough to handle for the child (who has lower dexterity).

7. The product must be safe for children to use aged 5-7 years old from foreseeable misuse.

7.a. The product must be safe to use under reasonable and foreseeable conditions by 5-7 year olds e.g. edge radius and entrapment hazards.

Meaningful

8. Clear feedback post finishing game must be received.

8.a. The feedback provided must be clear and of sufficient detail to allow the parent to feel that they can make an informed choice about whether or not their child needs further testing. As parents are not experts in this field, they value clear and straightforward feedback.

9. Empowering parents to take control of the situation for their child.

9.a. Giving parents confidence and relieving them of any possible anxiety by arming them with solid information to allow them to make the right decision for their child's future. A simple and fast way to reduce anxiety in parents.

Desirable

10. The feedback that is received should be timely.

10.a. Parent output should be available as soon as the game has ended to give the parents a feeling of emotional satisfaction with the whole game experience. '[Informative] feedback is crucial for learning, engagement and progression both in games and education' (Charles et al., 2010).

11. The child should find playing the game desirable, notwithstanding the parent receiving feedback.

11.a. The game format, colourings and design must create an engaging environment making the game experience exciting for the user over multiple games and uses. According to studies by the age of 5 children can stay engaged for 4-6 minutes on a single task (Speech Therapy Centres of Canada, 2013), this is why as stated above each of the dyslexia testing tasks should not last more than 4-6 minutes.

P.D.S.1: The physical board game and app must each be set up and ready to be played in 4-6 minutes (assuming the app is already downloaded)

Usable

Issue: In order for the child to be able to play and complete the game and therefore provide the desired output for the parent the game has to be successfully set-up. Setting up the game needs to be sufficiently simple in order to allow the players to commence playing and therefore benefit from the enjoyment of the game play. Given that parents would acquire the game as they have an underlying concern of a potential neuro-diversity in one or more of the child players a number of dimensions had to be considered in ensuring the child can satisfactorily set-up the game and then commence playing.

In undertaking the task analysis a number of different potential challenges had to be borne in mind and mitigated. The challenges identified included overcoming the negative consequences of the target age group's boredom threshold and attention span; ensuring that the instructions were simple enough to understand and also the positive or negative aspect of a group of children participating in the game set-up.

In designing any of the tasks, the fact that the youngest intended user for the product is a 5 year old must always be kept in consideration. Of all of the different set-up challenges the over-riding constraint in ensuring that set-up is effectively completed within the boredom threshold of the child. The other considerations will impact whether this can be achieved and therefore needed to be understood and the relevant design principles incorporated in the task analysis and improvement iterations.

Theories: According to Bhavi Sirpal (Speech Therapy Centres of Canada, 2013), the average attention span for a 5 year old on an assigned task is between 4-6 minutes.. Childhood development experts generally say that a reasonable attention span to expect of a child is two to three minutes per year of their age (Normal Attention Span Expectations By Age, n.d.). The task analysis must therefore look to respect these parameters in the game play (and set-up) design as 'any element that isn't helping the user achieve their goal is working against them' (Yablonski, 2016).

Along with the number of individual steps in a task, the complexity of the instructions and their presentation (Marcus, Cooper and Sweller, Journal of Educational Psychology 1996), will also have an impact on the time taken to complete a sequence. Instructional material may be difficult to understand if it consists of many elements that must be held in working memory simultaneously. 'Anywhere you are asking the user to remember information or make a decision contributes to cognitive load' (Yablonski, 2016). Research by Marcus, Cooper and Sweller (1996) shows that if students are required to follow instructions or engage in procedures that exceed working-memory capacity, then understanding, learning, and problem solving may be hampered.

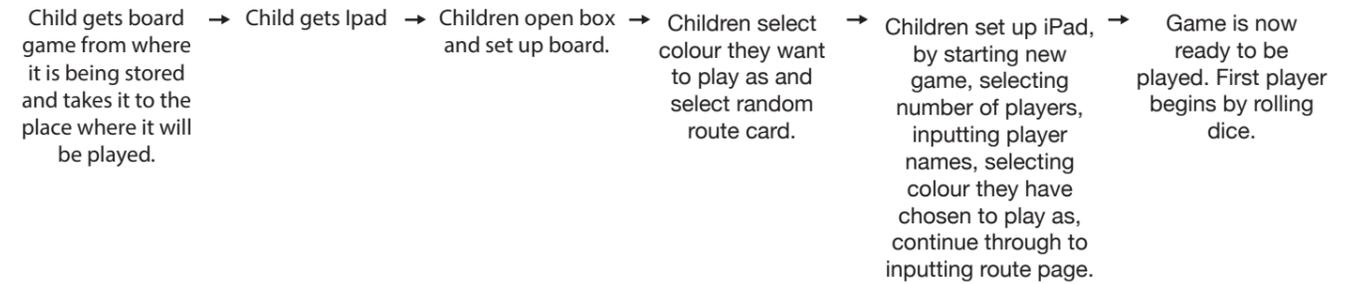
As the game is intended to be enjoyed by children both with and without neuro-diversities the fact that the set-up of the game is a group activity is positive as research shows that 'children working collaboratively towards a common goal achieve a higher performance output compared with individual efforts' (Fawcett and Garton, British Journal of Educational Psychology, 2011) and that children with lesser abilities are aided by collaborating with higher achievers.

Recommendation: In order for the child players to be able to benefit from the enjoyment of playing the game they must first be able to set-up the board, which in itself will give a sense of achievement and satisfaction. The game must be set-up correctly in order to be played and so the instructions must be easy enough to follow for the set-up to be effective. However, the overriding design criteria for the set-up has to be in avoiding the abandonment of the task due exceeding boredom thresholds and so the task analysis must ensure the process to be as efficient as possible.

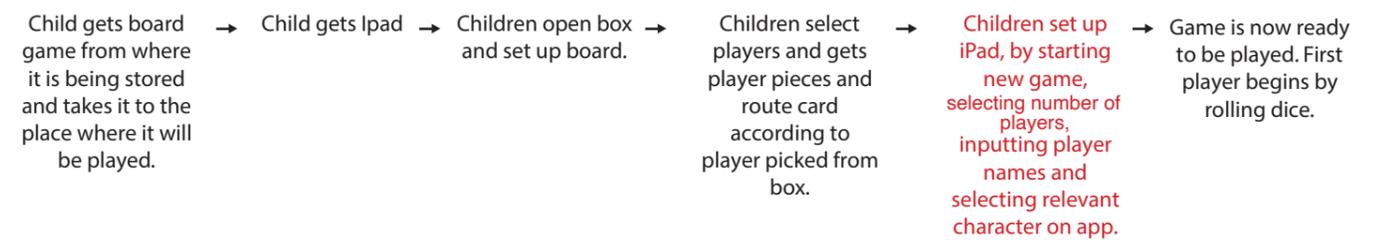
Application (Eliminating Tasks):

Task Analysis:

Original task analysis of setting up board and app:



Final task analysis of setting up board and app:



Once the task analysis had been completed and the number of tasks had been reduced through task elimination, the tasks went through user testing with 5 users. In testing users were asked to set up the game ready to be played and were timed during the activities. Both tasks were completed in an average time of 6 minutes. This fits into the time of 8-12 minutes total time for both tasks.

Now all that players have to do is once the app is started up is to select the player they want to play as. This has reduced the number of tasks and steps it takes to set up the game. This means that the players cognitive load has been reduced and creates greater enjoyment and incentive to play.

Final Outcome:

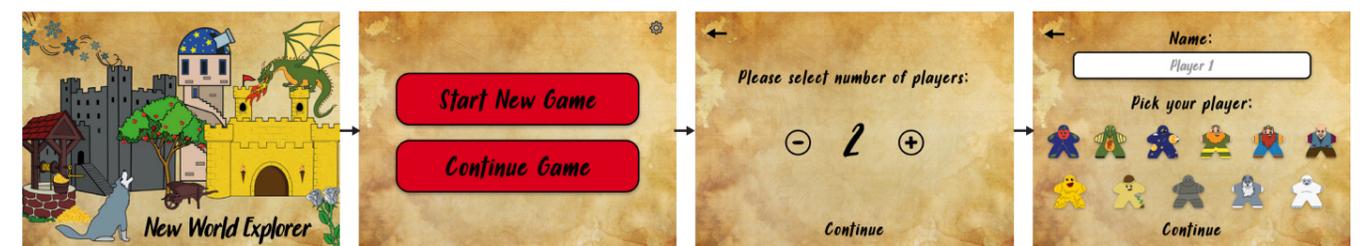


Image 2: Screenshots of set up pages of app

Since the set-up stages of the game have been reduced, making the game more efficient, players found set up of the game more engaging. Choosing a character rather than just a colour meant the game set-up was more satisfying. Each stage now had been cut down to the bare minimum to make the process as effective as possible so players did not waste time before being able to play.

P.D.S. 2: The game must be portable for a child aged 5-7 years old

Usable

The physical limitations of a 5 year old, the youngest target user, must always be kept in consideration.

Issue: In order for the game to be usable by the intended child age group it is highly desirable for the players to be able to retrieve and play the game without the assistance of an adult. Along with the satisfaction and enjoyment of being able to play the game the ability to access it without parental help will enhance the perception that it is a game rather than a screening tool that requires parental help. In order to achieve this objective it is therefore another design objective for the game to be physically accessible.

The physical development and capabilities of the target child age group must be addressed. The physical abilities that need to be considered and included into the design specifications are the weight of the product and dimensions of the game box being suitable. Both of these criteria will need to be suitably catered for in order that the game can be deemed portable by a child at the lower end of the target age group.

Theories: There is general consensus on the maximum weight that children in the target age group of 5-7 years old should safely carry. According to Dowshen (2016), 'doctors and physical therapists recommend that kids carry no more than 10-15% of their own body weight', while ScienceDaily (2019) suggests that a primary school child should not carry more than 10% of their body weight.

Recommendation: In order for the game to be usable by children and for them to be able to get the satisfaction of both being able to retrieve the game and therefore be able to enjoy the intended purpose of the game it is necessary that both the weight and size limitations of a five year old child are met in order for the product to be deemed portable.

Application (Weight):

According to Tilley's (2002) anthropometric data, the average 5 year old weighs 17.9kg.

As it is not recommended for a child to carry more than 10-15% of their own body weight.

A child of 5 years old should not carry a weight heavier than:

$$17.5\text{kg} \times 0.15 = 2.685\text{kg}$$

Therefore the child should not carry anymore than 2.5kg.

Once all elements of the game were created the board game company informed me, the game weight is 46.19 ounces or 1309.46 g or 1.31kg.

Therefore the weight of the box is acceptable for the minimum child age to carry the product and is child friendly.

Application (Box Size):

The board game box chosen from the board game company website is a:

$$\begin{aligned} \text{Large Retail Box} &= 11.75 \times 9.125 \times 2 \text{ inches} \\ &= 29.845 \times 23.1775 \times 5.08 \text{ cm} \\ &= \text{length} - 30 \text{ cm, width } 23 \text{ cm and height } 5 \text{ cm.} \end{aligned}$$

Snyder (1977) states that the mean middle finger to thumb grip length of a 5 year old child is 6cm.

Therefore as the box is 5cm tall, a child can easily hold the box in their hand grip and the product is child friendly.

Application (Arm Span):

The chosen box dimensions is for a width of 30cm. It is necessary to ensure that this is a size that children of 5 years old can carry in their arm span.

According to 'The Measure of Man and Woman' Tilley's (2002) the arm span of a five year old is averagely (only half the hand length is considered due to need for finger bending considerations):

$$(\text{Forearm length} \times 2) + (\text{Upper arm length} \times 2) + (\text{half hand length} \times 2) + \text{chest width}$$

$$(173\text{mm} \times 2) + (145\text{mm} \times 2) + (59.5\text{mm} \times 2) + 518\text{mm}$$

$$= 346 \text{ mm} + 290 \text{ mm} + 119 \text{ mm} + 518 \text{ mm}$$

$$= 1273 \text{ mm or } 127.3 \text{ cm}$$

As a child's arm span is so much greater than the length of the box, a 5 year old child will be able to carry the box.

Final Outcome:



Image 3: Final renders provided by the Game Crafter of the game box.

By ensuring that the box parameters chosen for the game met the physical limitations of a five year old, it ensured that even the youngest users could enjoy and participate in the game safely and effectively. It also allows set-up to be more independently undertaken by the child players making for more efficient play and giving the child players greater satisfaction.

P.D.S. 3: Each of the player pieces must be easily distinguishable

Usable

Issue: In order for the game to be played, all of the players must be able to identify their own and other players' pieces. While humans have five generally accepted senses, the sense that is being relied upon in this game is sight. While feel, in terms of textures of the materials used in pieces, their shape and weight could be distinguishing characteristics, the reliance on this sense in order to distinguish between different pieces would be more time consuming and interrupt the game flow therefore diminishing both the efficiency and effectiveness of the experience.

While it is not uncommon for players, both children and adults alike, to have a preference for a particular colour or character which could lead to an increased or decreased level of enjoyment ('Principles of colour theory can be applied successfully to characters and objects in game design to generate preferences towards some objects' (Lambrant, Luro and Sundstedt, 2015)) this is not a determining factor in the ability of players to distinguish between pieces and was therefore not a consideration in making the pieces distinguishable.

While colour is, for most people, a simple and quick characteristic in order to distinguish an object, form is another dimension of differentiation which can enhance the differentiation between pieces. Furthermore, as Data from the CDC's National Health Examination Survey from the early 1960s found a 3.8% overall prevalence of colour blindness in children ages 6 to 11 years (Kaiser, 2014) in order to maximise the potential enjoyment and satisfaction from as wide a child population as possible ensuring that colour was not the only visual feature being relied upon was important to the design criteria.

Theories: 'If something is distinguishable from other things, it has a quality or feature which makes it possible for you to recognize it and see that it is different' (Distinguishable, 1708). In order to increase distinguishability and reduce ambiguity form and colour have both been used in games for centuries and can not only differentiate between the pieces of one player but also where different pieces may have different uses, as explained by Mora, di Loreto and Divitini, (2016) 'Each token has a tangible representation (i.e., shape and colour) that identifies the piece and defines its affordances'.

While the 'Principles of colour theory can be applied successfully to characters and objects in game design to generate preferences towards some objects' (Lambrant, Luro and Sundstedt, 2015) this was not considered a design objective to fulfil the PDS of distinguishability. 'Value, saturation and hue can all be used to distinguish important elements...Colors in games are used to identify different elements and alert the player to properties of elements...Color identifiers (also known as glyphs) are used to group and separate game elements, such as differentiating players' (Tulleken, 2015).

'Color identifiers can group and separate game elements clearly' (Anhut, 2014). Primary colours are frequently used to make pieces distinguishable. In order to minimise the impact on any players that might be afflicted by colour blindness there are colour palettes with 'set(s) of colors that [are] unambiguous both to colorblinds and non-colorblinds' (Goedhart, 2019), however due to the wide breath in types of colour blindness and the quantity of different colour scales that do not always contain saturated colours enough to attract children it was decided against using them and more standard game piece colours were used.

Alongside colour, form is another feature that allows players to easily distinguish pieces. 'Pieces usually represent players and resources via iconic or symbolic artefacts' (Mora, di Loreto and Divitini, 2016) and therefore ensuring that the form, used to assist in distinguishing pieces can also contribute to assisting players in understanding the use of the piece, as opposed to different distinguishable shapes which symbolic value was an additional consideration not directly contributing to this PDS.

Recommendation: Visible characteristics are, for the vast majority of the population, the easiest attributes in order to make quick and definitive judgements to distinguish between objects. Colour and form, with the use of appropriate colour palettes, give sufficient choice and possible combinations in order to ensure that all of the required piece differentiation is possible to allow the pieces of the game to be easily distinguishable.

Application:

Originally standard pieces were used, backpackers for the player piece and houses for the settlements.



Image 4: Image by author of original playing pieces acquired for the game.

'[Saturated] colours are perceived as more exciting and dynamic' (Lidwell, Holden and Butler, 2010). In this case some of the colours on the players and board pieces were considered too unsaturated and considering the target user, this is less appealing. Therefore, the colours have been made more saturated and brighter. Through user testing the changed out pieces were reviewed and the brighter ones preferred by the users.

Final Outcome:



Image 5: Render of final playing pieces by author.

Due to colour and shape theory researched, pieces have been made so they were more incorporated into the game style by having pieces related to a country that is visitable on the board.

As meeples are a standard shape, graphics were used to distinguish between them.

Settlement pieces, with most pieces having their own colour to ensure maximum personalisation and distinguishability.

It is important that players can identify their own pieces while playing the game, so through the use of shapes, colours and graphics more distinguishable pieces were created. This in turn makes the game more efficient, effective and satisfying for the individual players but also for the group engagement in the game play.

P.D.S. 4: The font size used for a viewing distance of 500mm should not be smaller than 8pt on the app (BS EN ISO 9241-303:2011)

Usable

Issue: In order for the game to be played and also for the feedback to be viewed it is necessary for both the child players and the parents who receive the feedback to be able to easily read all text and symbols on the app. In considering the available design decisions impacting visual acuity font size, the distance from which the app might be viewed, the sharpness of any symbols and the brightness / contrast of the screen as well as to employ any special effects and or motion graphics were reviewed.

The readability of a display is primarily a function of distance and font size. While special effects or motion graphics have not been used, consideration of sharpness and brightness / contrast could be fine-tuned further in any production development iterations of the app. However, in order to ensure the usability of the app distance and font size were taken as the most important design criteria.

Theories: There are numerous guidelines for recommended font specifications online such as Apple’s Human Interface Guidelines (Human Interface Guidelines - Design - Apple Developer, n.d.). However, many of these appear to be driven by competing product ideology rather than objective user considerations.

Kennedy (2020) summarises three principles of Typography to be considered when deciding upon a font size to be used. These include Angular Size, The 1/16”th Rule and The Pixel Density-Viewing Distance offset. The angular size is the basis for the British Standards guidance.

British Standards have issued guidance on both character height (font size) and viewing distance in the format of trigonometric degrees (arc), where ‘Minimum Latin character height shall be 16° of arc’ (British Standards Institution, 2008). While this will allow designers to adjust font size dependent on the intended viewing distance they also have recommended a minimum distance that is relevant for the product app. The British Standards Regulations state that ‘the design viewing distance is dependent on the task and on the electronic visual display and shall not be less than 300mm’, (British Standards Institution, 2011).

In order to be able assist visually impaired users as well as older users, who are more likely to have sight difficulties BS EN ISO 9241-125:2017 suggests that the size of electronically displayed text should be able to be enlarged (and reduced) in order to make the output as widely available as possible. This is a design consideration that will be retained for the final product build but was not achievable in the prototype due to prototyping software limitations.

Recommendation: To ensure the usability of the App from the perspective of users being able to comfortably and with minimal effort read the text presented the Angular Size principle, as recommended in the British Standard BS EN ISO 9241-303:2011, should be used to calculate the appropriate font size.

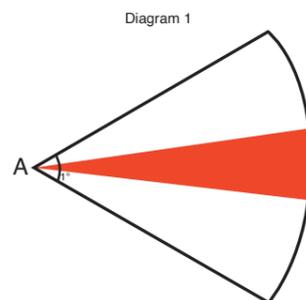
The ability to implement the functionality to reduce and enlarge the font size should be retained as a design ambition for app versions beyond the prototype.

Application:

A minute of arc is a unit of angular measurement equal to one degree and is made up of 60 arcminutes.

Diagram 1 demonstrates what the British Standard Institute requires a user to see to allow for 20/20 vision from 1°, if the eye was positioned at point A.

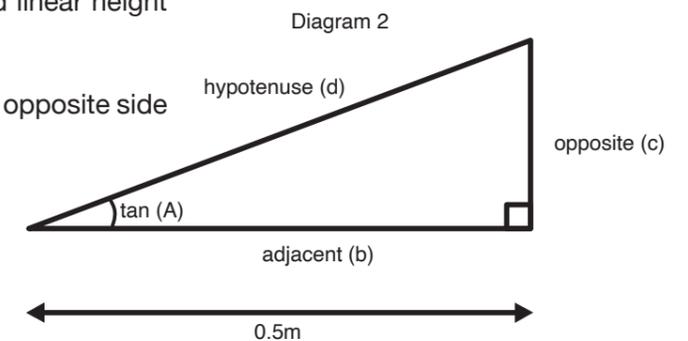
As there are 60 arcminutes in 1°
 --> 1 minute of arc = 1/60 °
 --> 0.0166667 = (A)



Trigonometry allows for the height (c) of one minute of arc to be calculated from a distance of 500mm (the average distance an I-Pad user will be from the screen). This is demonstrated in Diagram 2, with the visual angle (tan(a)), viewing distance (b) and linear height (c - that needs to be calculated).

The tangent (tan) function is defined as the ratio of the opposite side (c) to the adjacent side (b):

$$\tan(A) = \frac{\text{opposite (c)}}{\text{adjacent (b)}}$$



This equation can then be re-arranged to help calculate the linear height (opposite (c)):
 opposite (c) = tan (A) x adjacent (b)

Therefore:

$$\text{opposite (c)} = \tan(0.0166667) \times 0.5 = 0.000145447017317 \text{ m}$$

This is then multiplied by 16 as this is the minute arc required by the British Standards Institute:

$$\text{opposite (c)} = 0.000145447017317 \times 16 = 0.002327152277072 \text{ m}$$

Therefore:

$$\text{opposite (c)} = 0.233 \text{ cm or } 2.33 \text{ mm.}$$

Through these calculations character height should be at least 16° of arc, that the **height of the characters must be at least 2.33mm and therefore no smaller than a size 8pt font** (and any icons, graphics or images should be no smaller than fitting in a cube size 2.33mm x 2.33 mm).

Final Outcome:



Image 6: Screenshot of game play page in game.

Due to the font size limitations calculated the image on the left is an example of a key iPad page where the font was constantly kept between size 16pt to 20pt (and icons are 0.76mm) ensuring to meet visual acuity requirements and allowing for effective viewing of all elements on the page, making the game play more efficient and ultimately satisfying.

P.D.S. 5: The iconography in the app should be clear and recognisable in less than 5 seconds by a test sample of 5 users

Usable

Issue: Iconography in normal everyday use is ‘the use of images and symbols to represent ideas, or the particular images and symbols used in this way by a religious or political group, etc.’ (Iconography, 2020). However, the word has become widely used in software and particularly app development due to the usage of icons. In this context ‘Iconography is a visual language used to represent features, functionality, or content. Icons are meant to be simple, visual elements that are recognized and understood immediately’ (Crump, 2016).

The use of icons within app design has become commonplace and almost second nature to users. In order that they contribute to the usability of the app they should not require excessive thought in order for the user to understand the functionality they represent. They should also be quickly recognisable so being both effective and efficient and enhancing the users experience of the interface and thereby their satisfaction.

As icons are in such common use today a number of ‘quasi’ standards have emerged, such as a floppy disk (while no longer in common use) to represent the ‘save’ function others are more abstract such as the ‘gear’ symbol for settings or the ‘beachball’ or ‘hourglass’ to represent a waiting period.

In order for the iconography used in the app to not distract users from the experience of the game or feedback through the app the design principles for usability that were followed were that they should be both clear and recognisable.

Theories:

Collins dictionary definition for clear ‘something that is clear is easy to understand, see, or hear’ (Clear, 1708).

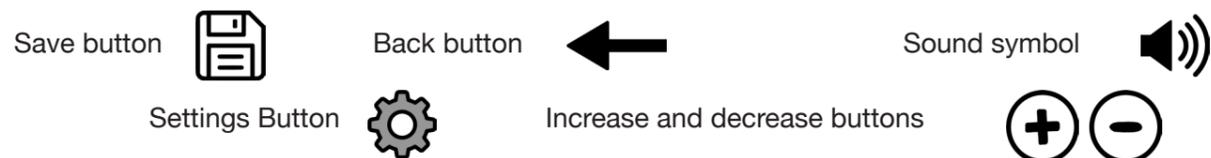
Collins dictionary definition for recognisable ‘easy to know or identify’ (Recognisable, 1708).

Where the designer needs to produce an icon that is not already in common usage or wishes to introduce a new icon that represents a common function it is suggested that it should conform to ‘A situation where an object’s sensory characteristics intuitively imply its functionality and use’ (Borowska, 2015).

Recommendation: In order to be both clear and recognisable the design principle followed is to use commonly used, ‘standard’ icons to represent functions that users will be familiar with. In order to ensure that the chosen icons meet the required PDS criteria the Guide to Testing Iconography (2018) for Recognisability and Comprehensibility / Clarity should be used to validate with a sample of users that the objective is met.

Application - Metaphorical Affordance:

Throughout the app icons have been used to represent certain functions. For example:



For this metaphorical affordance was used, using familiar symbols that people have become accustomed to ensure ease. This allows for saving screen space, improving visual appeal, can be optimised for fingers and works across all language barriers. But as one of the target groups for this product are young they may not be familiar with some functionality, therefore user testing was carried out. According to A Guide to Testing Iconography (2018) the type of testing carried should be: find-ability of the icons, recognisability, comprehensibility and aesthetic appeal, we will be focusing on two of these as they are most relevant.

Recognisability

Harley (2016), suggests that testing for recognisability is best done out of context, therefore, the icons (example of what users were shown can be seen in image 7) were printed onto individual pages. A group of 5 participants was used, 3 children (5, 6 and 7 years old) and 2 parents. They were brought into a quiet room and were shown the symbols one by one and asked what they thought it meant. Once the symbol had been shown a timer was started and once the icon had been recognised correctly the timer stopped.

The participants recognised all symbols correctly in under 5 seconds. This meant that the symbols were recognisable for users and by having icons that users recognise easily will help to reduce cognitive load.

Comprehensibility/Clarity

It is important that users can not only recognise the symbols but also understand what they mean. To test this users were asked what they thought would happen when the button was pressed in the context of the app.

This test was carried out with the same participants and they were all able to successfully identify what would happen when each of the buttons were pressed. (Images on the right, demonstrate the pages the users were shown and the symbols highlighted in red are what they were asked to interpret). Due to the ease in with which users were able to understand what would happen when the buttons were pressed, the icons can be said to be clear, again reducing cognitive load of the users.

Final Outcome:



Icons in the app were used to replace/minimise the number of words, in the hope to minimise cognitive load on users. Metaphorical affordance was key in this to ensure effective and efficient icons were used.



Image 7: Icons created by author used in app.



Image 8: Screenshots of app pages showing the use of icons that participants were shown.

Issue: As the game is intended for child players as young as five years old it is necessary to take into account the fine motor skill development of this age group. For the target age group of 5-7 years olds to be able to play the game independently they must be physically able to grip the playing pieces in order to fulfil the game play. This is necessary for them to be able to participate and play the game but also necessary in order for the parent to receive the feedback after the game has finished.

It is therefore necessary to include in the design principles player piece size parameters that ensure the intended child players can participate.

Theories: The Tripod Grip is 'a functional grasp which is essential for a number of tasks' (Tripod Grip, n.d.) which a child typically develops between the ages of 3-4 years old. It is this ability that allows for the delicate grasping of game pieces. Once this skill has been mastered, among other things it allows children to participate in board games from the age of 5, as identified by O'Brien and Miller-Kuhaneck (2015).

Recommendation: By the age of 5 the vast majority of children have developed the tripod functional grip and can therefore practically grip the playing pieces to participate in the game. The pieces must be of suitable dimensions for the hand size of five year olds.

Application - Fine Finger Dexterity:

Average 5 year old Child's Finger Grip

Tilley's (2002) anthropometric data states that a 5 year old child's mean middle finger to thumb grip size = 6.4cm, therefore the pieces should not be any larger than 6.4cm.

5th Percentile of 5 year old Child's Finger Grip

However, Tilley's (2002) anthropometric data also states that the 5th percentile of a child's middle finger to thumb grip size = 4.7cm, therefore to ensure that the product is inclusive, the pieces should not be bigger than 4.7cm.

According to Lee-Valkov et al. (2003), a young child cannot easily grip sizes smaller than 0.25 in (0.635cm), therefore the minimum size of the pieces will be 0.6cm.

As a result of the above research, all pieces were made to fit into these dimensions, some examples of the pieces against a ruler (to demonstrate size) have been included. While some pieces used are standard sizes e.g. meeples and dice, the settlement pieces are personalised, so while making them it was important to make sure that the parameter restrictions were followed with the use of ruler guides in the design software.

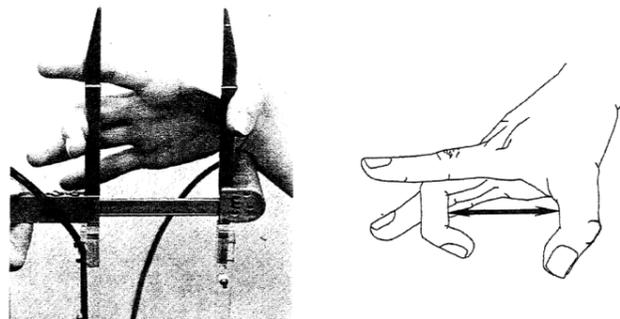


Image 9: Image showing how middle finger to thumb grip measured (Tilley, 2002).

Final Outcome:

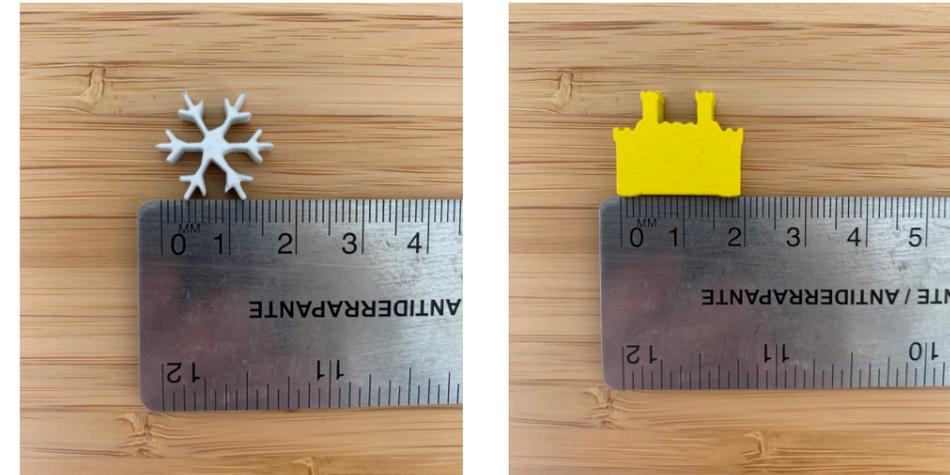


Image 10,11 & 12: Images of final playing pieces against a ruler for dimensions.



Ensuring the pieces were of suitable size for the child players was key to ensure that the practical purpose they were created for could be carried out as smoothly as possible. By ensuring that the player pieces fit into the restrictions stated even the youngest players with reduced mobility will be able to participate.

P.D.S. 7: The product must be safe for children to use aged 5-7 years old from foreseeable misuse

Useful

Issue: The product is intended to be played by children, while providing useful and meaningful output to adults. As children are expected to play the game, potentially unsupervised, it is important that the game is safe for them from foreseeable misuse. It is therefore necessary to try and identify and mitigate possible hazards.

Theories: ‘Toys are products designed or intended (whether or not exclusively) for use in play by children under 14 years old’ (Toy manufacturers, importers and distributors: your responsibilities, 2019).

‘A manufacturer is required to carry out a safety assessment before placing a toy on the market’ (Toy manufacturers, importers and distributors: your responsibilities, 2019).

‘Toys must not adversely affect the safety or health of users or third parties when used as intended or in a foreseeable way, bearing in mind the behaviour of children’ (Toy manufacturers, importers and distributors: your responsibilities, 2019).

‘Where the toy has been shown to conform to the essential safety requirements the manufacturer must draw up an CE declaration... The manufacturer must affix the CE marking to the toy, to an affixed label or to the packaging... CE marking is a visible declaration by a manufacturer that the toy satisfies all the provisions of the Toys (Safety) Regulations 2011’ (Toy manufacturers, importers and distributors: your responsibilities, 2019).

Recommendation: The recommended advice from the government is that it is a manufacturer’s duty to carry out a safety assessment on products they produce. It is important to select a manufacturer that complies with the EU healthy and safety toy regulations (has an EN71 certificate). It is recommended that a safety / risk assessment is carried out independently of the manufacturer and to address any issues found with the manufacturer to ensure that any risks identified are mitigated.

Application:

| Hazard Group | Hazard Type | Injury Scenario | Injury | Probability | Impact | Priority | Mitigation | Impact post mitigation |
|---------------------------|--|--|---|-------------|--------|----------|--|------------------------|
| Fire Safety | Fire | If child uses product near open flame, the game could catch on fire and cause the child to then get burnt. | Burnt | 1 | 3 | 3 | Ensure in instruction manual to include not to play near open flame. | 2 |
| Toxicity | Irritating or corrosive solid or fluid | A child plays with board game and pieces. The child puts pieces in mouth covered in a toxic material. The parents don't notice in time. Associated chemicals are swallowed and develops in the intestinal channel and causes damage. | Ingestion of toxic material (Internal organ injury) | 1 | 3 | 3 | Ensure the manufacturer uses non-toxic materials and coatings for all the pieces within the product. | 1 |
| Size, shape and surface | Packaging is impermeable to air | The child plays with the plastic packaging of a toy. Places it over their mouth and nose. The parents don't notice in time. The child is unable to remove the plastic packaging. The airflow is temporarily blocked. | Suffocation / Strangulation | 1 | 3 | 3 | As stated in EN71 any plastic packaging will comply by having 'average sheet thickness of 0,038 mm or more when tested according to 8.25.1 (plastic sheeting, thickness)' (British Standards Institute, 2011). | 1 |
| Size, shape and surface | Sharp Edges | A child plays with pieces that have sharp edges. The sharp edges are visible. The parents don't notice in time. The child touches pieces with the sharp edge. The child cuts its fingers, tongue or lips. | Superficial cut | 1 | 1 | 1 | En71 only applies this standard to glass and metal, however after the pieces have been cut out, they shall be tested for sharp edging and sanded down if necessary. | 1 |
| Size, shape and surface | Product contains small parts | The child is playing with the game and they put a piece in their mouth, accidentally swallow it, without parents noticing, blocking the child's airway. | Airways obstruction | 1 | 3 | 3 | Ensure correct labelling has been applied. | 1 |
| Size, shape and surface | Opening between elements (entrapment) | A child is putting together the board which does have a locking mechanism. The child's finger gets pinched in between pieces. | Pinched finger | 1 | 1 | 1 | Made sure board pieces don't lock together therefore fingers cannot get trapped in between pieces | 1 |
| Product operating hazards | Insufficient warning texts and symbols | If the toy doesn't warn the parents that it shouldn't be given to children under 36 months, the parent gives it to a small child. The child could suffer from any of the above. | All of the above | 1 | 3 | 3 | Ensure all correct labelling is on the product and box e.g. not suitable for under 36 months label. | 1 |

Final Outcome:

The risk assessment was carried out on the original concept. Once improvements and mitigating actions were taken the assessment was carried out again. The manufacturer selected for the prototype is EN71 certified and the game is CE marked. The assessment will be retained in order to re-use when a final production manufacturer is selected.



Image 13: The box design for the product with all necessary labelling and markings.

Due to the genre of game created the risk of injury is very slim. Not a single hazard scoring above the possible half way mark (score possibilities being 1, 2, 3, 4, 6, 9), as result it was decided that no further testing or mitigations needed to be put in place.

P.D.S. 8: Clear feedback post finishing game must be received

Meaningful

Issue: As the USP of this product, to the adult purchaser, is as a non-intrusive screening tool to empower them to understand whether to have their child formally assessed for dyslexia it is assumed that the parent has some concern and has researched some information on dyslexia. When parents first think there might be a need to screen their child they will probably not be very informed about the condition and 95% of parents ‘feel that they lack the skills and knowledge to support their child’s dyslexia’ (Hicks, 2019).

Screening is a first step in supporting a child that might have dyslexia and ‘Screening results can give useful evidence to justify a request for a full assessment’ (Dyslexia FAQ for Parents | Dyslexia Questions and Answers| Helen Arkell Dyslexia Centre, n.d.). In order for the product to fulfil its primary function the feedback received by parents must be meaningful in achieving its aim in screening and then providing worthwhile guidance on what action might be advisable.

Theories: Collins dictionary definition for clear ‘something that is clear is easy to understand, see, or hear’ (Clear, 1708). ‘Clear feedback that communicates specific information to the [user] is another best practice for giving effective online feedback’ (Leibold and Schwarz, 2015). However, the challenge is presenting the feedback is a balance between providing a simple answer and explaining the results.

‘The more ‘cognitive’ information-processing research of the past decade also clearly suggests that when individuals are processing information relevant to decisions and judgements, they heavily favour the use of concrete over abstract information’ (Reser and Scherl, 1988).

Recommendation: The feedback provided must be clear and of sufficient detail to allow the parent to feel that they can make an informed choice about whether or not their child needs further testing, so the guidelines displayed by A.2.1.2 Visual feedback/invitation – PD IEC TR 61997:2001 (British Standards Institute, 2001), should be followed to ensure maximum clarity while creating the report.

In order to present the information the following guidelines should be followed; ‘Compile relevant information, Break it down, Organise the information, Use Clear information, Use formatting to your advantage’ (Sears, 2016).

‘[Visibility] to assure anxiety-free operations’ British Standards Institute (2001) advises making the ‘design operations to flow from upper left to lower right’ (British Standards Institute, 2001). This should be followed to ensure the parent’s report had a good and clear flow.

Prior to going into commercial production it will be necessary to get clear and precise signposting guidance from a trained educational or chartered psychologist, as to the appropriate steps available from the specific results.

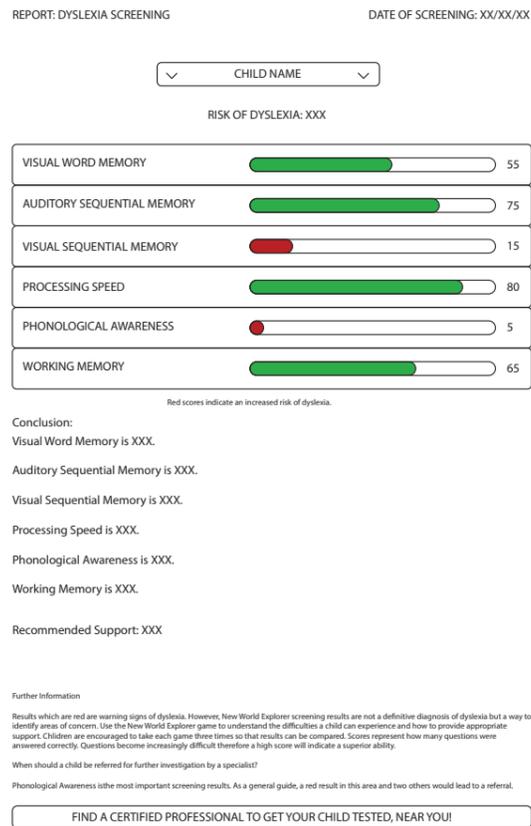


Image 14: Original parent’s report to show changes made to make the report clearer.

Application:

If the child’s results are concerning the word ‘high’ would be highlighted in red, otherwise ‘Medium’ in orange or ‘Low’ in green, following the RAG principle (Veromann, n.d.).

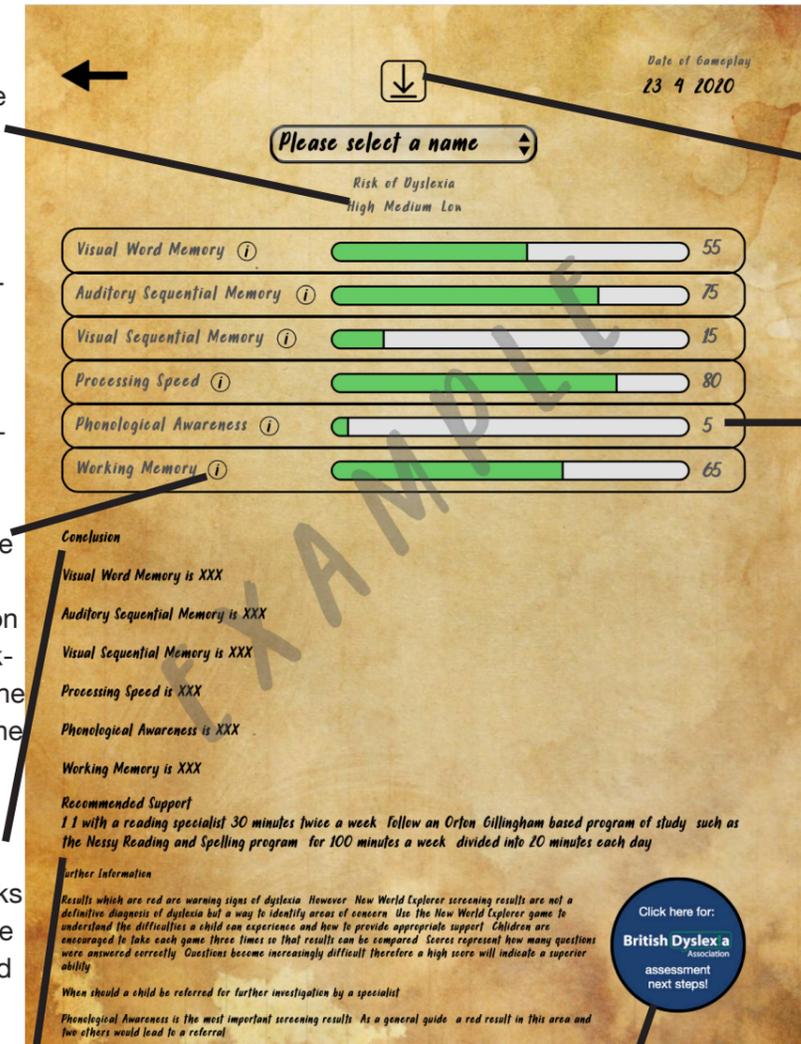
Once again ‘pattern affordance’ (Borowska, 2015) helps parents to understand they will receive more detailed information by clicking this button which helps to breakdown jargon about the meaning of data in the test areas.

Conclusion section which explains/breaks down further the type of difficulty their child will be having within this area and what it means.

Recommended support section that appears if the child demonstrates enough signs that they might need further support and assistance. This support may come in the form of work parents can do with child or it might recommend going to find a specialist for further testing.

Final Outcome:

By using methods to help breakdown jargon and explain data presented in the report, parents should be able to clearly understand the information provided about the child and if needed use the information to help the child. Colour association helps parents to understand areas of difficulty, this has not been used in the report above due to prototyping software limitations but where stated would occur in the final developed app. By allowing parents to have clear information about their child’s difficulties and how to help them it provides the parents with valuable feedback that can make their investment in the product worthwhile.



If further testing is recommended, then this button will appear, which allows parents to find certified help for further testing.

Through ‘pattern affordance’ (Borowska, 2015), the download icon is easily recognisable for parent’s so they can save and view the report whenever needed.

Each quest completed by the child is related to a different testing area for dyslexia. Here the areas are broken down, with the player being given a score out of 100, with the use of numbers and the a coloured bar. Using ‘colour coding principles’ (British Standards Institution, 2001), when a score is below 25 the bars should turn red to indicate that it is a serious area of concern that should be looked into.

Issue: Dyslexia is a complex and multi-faceted condition and can have a range of consequences on the sufferer from mild to severe. The fact that it is not necessarily easy to detect but that the impact on a child's future prospects may be great means that many parents are anxious about how to deal with any concerns they might have. As a full dyslexia assessment can be expensive and also be upsetting to the child, being able to provide parents with good information and a few simple choices is very empowering to parents. It is also rewarding by helping to relieve both their and potentially their child's anxiety quickly, at a relatively low cost in terms of investment and time.

The challenge is to provide sufficient information and simple choices, while allowing the parent to control the outcome for their child and to feel they have fulfilled their parental duty.

Theories: Empowerment - 'the process of becoming stronger and more confident, especially in controlling one's life and claiming one's rights' (Stevenson, 2010).

Maslow's Hierarchy of Needs is explained by 'Needs lower down in the hierarchy must be satisfied before individuals can attend to needs higher up. From the bottom of the hierarchy upwards, the needs are: physiological, safety, love and belonging, esteem, and self-actualization' (McLeod, 2020).

The Paradox of choice, 'it has been demonstrated that increasing the number of options beyond a handful can lead to paralysis and poor choice and decrease satisfaction with the choice' (Allan and Aslam, 2009). A Redefinition of the Paradox of Choice (Piasecki and Hanna, 2011) applies the original theory to the modern world where simplified choice is now offered through the role of influencers/experts vs search engines that just give you popular results (or recommender vs artificial algorithms).

Recommendation: The anxiety caused by the prospect of un-diagnosed dyslexia and the negative consequences for a child's higher needs, as defined by Maslow, feeds directly into a parent's basic needs of safety and security for the family. By simplifying both, a relatively complex screening process and the presentation of simple choices and sources of information empowers parents to feel that they are making good choices and therefore satisfying their basic needs.

By reducing the number of possible choices and simplifying the decisions to be made, while providing 'expert' recommender guidance allows parents to deal with their concerns over the possibility of their child having dyslexia and if this is a possibility guiding them to help.

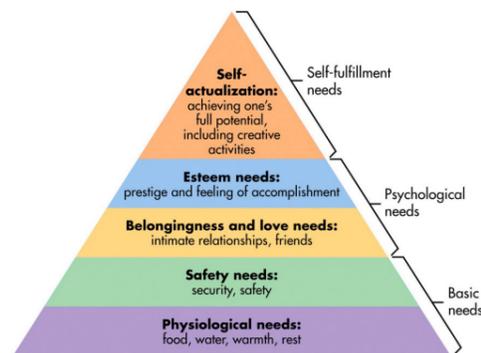
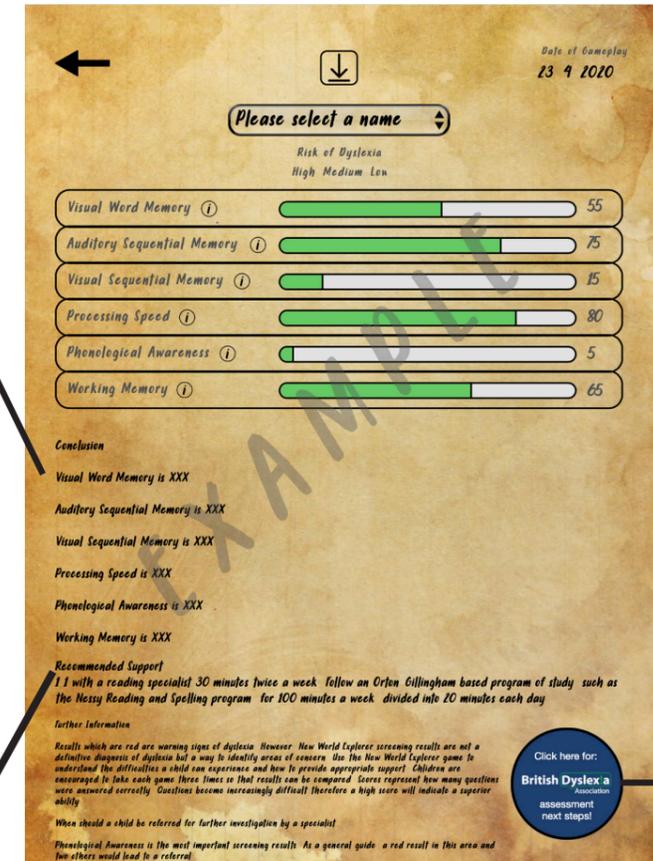


Image 13: Maslow's Hierarchy of Needs Diagram (McLeod, 2020).

Application:

By having each task broken down and explained it allows parents to better understand how and where their child is struggling. This allows them to have more informed conversations for their child and allows them to understand at a deeper level what their child is going through. In turn this makes them feel more confident and allows them to take greater control of the situation.



If further testing is recommended, then this button will appear, which allows parents to find certified help for further testing, giving them the information and control they need to take any next steps. By having this button appear it is giving the parents one clear instruction of what they should do next without overwhelming them with options.

The recommended support section that appears if the child demonstrates signs that they might need further support and assistance. This support may come in the form of work parents can do with child or it might recommend going to find a specialist for further testing, this again gives the parents greater control as it allows them to make the decision of what they think is the best way to help their child in a more informed way.

Final Outcome:

By providing parents with information that will allow them to be more knowledgeable and informed about any decisions they might want to make will allow parents to feel more in control of the situation. This feeling of control in turn makes parents feel more confident. If a product can give or provide you confidence in an area where you may have anxieties, the product's value is demonstrated, making the purchasing worthwhile.

Issue: The product has been developed in order to satisfy the differing needs of two target audiences, parents and children. They have distinct needs and in order for the product to be successful it must satisfy both and across the range of needs. So, while being meaningful to parents by providing them with valuable and worthwhile information and guidance it should also be desirable by evoking an emotional response.

By designing a product that meets the needs of the two target audiences and the combination of modern app based technology, in both the game play and in the feedback generation with a traditional board game format means that the feedback received by parents must meet the now everyday speed that people have become familiar with in using modern technology.

Theories: In today's world, 'people are simply much less patient than they used to be' (Ackerman, 2020). In all manner of activities they have become used to 'Instant gratification, (which is) the desire to experience pleasure or fulfilment without delay or deferment' (Patel, 2014). This is equally true where 'Feedback must be immediate: even a delay of a tenth of a second can be disconcerting' (Norman, 2013).

So much of the expectation around technology is related to speed of response and so timeliness is both appreciated and can be a source of both positive and negative emotional reaction.

There is no agreement on how many emotions exist. Eckman suggests that there are six, while Power and Dalgleish (1999), later expanded to seven, basic emotions. More recent theories have expanded on these and added more complex definitions built upon the basic emotions. Starting with the basic emotions, Anger, Disgust, Fear, Happiness, Sadness and Surprise, four are negative, one positive and one, Surprise, could be either.

Recommendation: In order that parents find the product desirable it must evoke both appreciation and an emotional response. By providing feedback, the app can produce happiness and a positive surprise if the screening shows that the child is unlikely to have dyslexia while also relieving some underlying fear.

Where the feedback indicates that screening could be beneficial this may not evoke happiness but will reduce uncertainty and the fear of the unknown that prompted the parent to acquire the product in the first place. As the feedback will also provide suggestions and guidance on further help available any immediate fear will be balanced with positivity.

As a child's well-being is an emotive issue for parents and by incorporating technology into the screening it is possible and should be a design principle that feedback should be provided as quickly as possible in order to meet today's expectation of instant gratification and to make the emotional experience of the parent a positive one.

Application: The key is to make things as easy as possible for the user, so when a child presses the button to exit the game a report gets created instantly and sent to the parents. The concept and what is received is complex, however, the app allows for a simple method of receiving the desired information quickly and clearly.

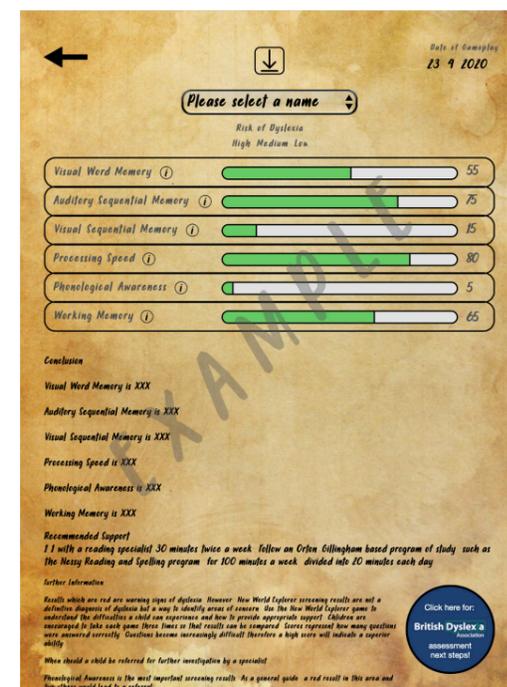
The report will be developed with an in-built algorithm that once the game is completed, it will pull together all the information it has gathered from each player throughout the game play tasks and compile them into a structured, clear report that parents can then act upon if needed. By having the report created like this the results can be received immediately by the parent, which turns an otherwise stressful situation into a stress free and empowering situation.

A user test was completed to understand how quickly user's would like to receive the information. This was completed by users having to complete a short questionnaire with the promise of receiving instant feedback. There was a total of 10 participants, where 3 were not sent feedback for a day, the next 3 were sent feedback an hour after completing the questionnaire, while the last 4 were sent instant feedback (received in under 1 minute). Out of all the participants the four that received instant feedback were the most pleased.

The result of receiving feedback immediately is also beneficial for the child as the sooner the parent receives feedback the sooner the child can receive the necessary help.

The product was adapted to meet the standards of today's users, where originally the product only had the option of being emailed the report to the parent so they have a permanent copy of the report. However, to meet the needs of immediate feedback, now there is also the option to view the report on the app. So as soon as the game is finished it can be viewed within the app and downloaded from there.

Final Outcome:



Due to users expectations today of speedy feedback ensuring that parents received feedback in a timely manner was key. Technological advancements have made this possible with algorithms that can be put into place to allow for tables and reports to be created and received efficiently. This evokes appreciation by the parents.

Image 16: Final report layout provided by author.

P.D.S. 11: The child should find playing the game desirable, notwithstanding the parent receiving feedback

Desirable

Issue: While the primary purpose of the product is to provide screening feedback to parents it is an important consideration that child players should not feel that they are being 'tested' in any way. In order to achieve this the game must be desirable to the child players on a par with other playtime activities.

Games and boardgames in particular have long been an activity that evoke emotions, pleasure and appreciation. From sensory and aesthetic enjoyment of the physical product to the sense of adventure and imagination that the game design can allow the players. Both the physical and game play concept need to work together to make sure the product is very desirable.

Theories: Norman (2005) suggests that there are three levels of emotional design for games, the visceral (appearance), behavioural (fun and utility of use) and reflective (self-image, personal satisfaction and memories). From a visceral perspective touch, sound and sight can all add to appreciation, for example '[Saturated] colours are perceived as more exciting and dynamic' (Lidwell, Holden and Butler, 2010).

Woods' EUROGAMES (2012) research found that the potential for replayability as the most important factor in players' enjoyment of games. Component quality was also considered to be very (25 percent) or quite important (56 percent) by 81 percent of respondents. 'The general production quality of a game contributes significantly to their enjoyment... the tactile nature of physical game play is closely related to the pleasure of playing with a toy' (Woods, 2012).

As well as the physical properties of the product the format choices can have an impact on the desirability of a game. While there is a sense that contemporary children are 'addicted' to electronic devices research has shown that boardgames still produce higher emotional responses (Fang, Chen and Huang, 2016). This study provides clear evidence that players of traditional board games 'feel intimacy, vivid imagery, sympathetic responses, and satisfaction while playing the board game' (Fang, Chen and Huang, 2016). The results also concluded that 'traditional games not only evoked users' stronger emotional reactions, both positive and negative, but also received higher preferences. Regarding social interaction, traditional games could improve interpersonal relationships. New digital games could not replace the sense of social interaction created by traditional physical games' (Fang, Chen and Huang, 2016).

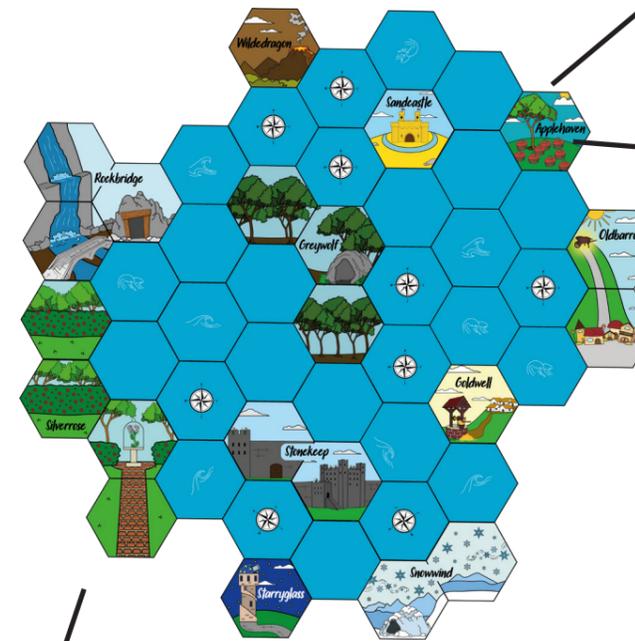
Alongside the game format decision the actual game play can evoke different types of emotion. A study by XEO Design Inc. (Lazzaro, 2004) found that four different types of emotions are triggered by playing games:

1. From their internal experiences in reaction to the visceral, behaviour, cognitive, and social properties and these players experience sensations such as excitement or relief from their thoughts and feelings.
2. Players like the opportunities for challenge, strategy, and problem solving.
3. Enjoyment comes from intrigue and curiosity generating emotions of wonder, awe and mystery.
4. Games are also mechanisms for social experiences. These players enjoy the emotions of amusement, from social experiences of competition, teamwork, as well as opportunity for social bonding and personal recognition that comes from playing with others.

Recommendation: The product must appeal to the child players on a number of levels in order to ensure its desirability and make children want to play it rather than being encouraged by parents in order to get the feedback.

The game concept of building and then going on an adventure in a make believe world must be tied back to the physical product to ensure that a consistent and truly desirable game is offered to the children.

Application:



Form (Visual Aesthetics) - The form of the game has been made to appeal to children so they desire to play the game e.g by making a board they can put together themselves or age appropriate graphics.

Detail (Visual Aesthetics) - The detailing in the design of the game e.g. graphics, has all been created to appeal to child user of the product. Age appropriate designs help to instill a sense of adventure in the child, by making the world look like a globe (even though it is a made up world). Characters relating to those specific countries help immerse the child further into the game.

- Saturated colours were used to make the game as appealing to children as possible as they are perceived to be 'more exciting and dynamic' (Lidwell, Holden and Butler, 2010).

Through user testing when asked, 100% of users agreed to liking the style and graphics of the game.

Shape (Touch Aesthetics) - The board being made up of individual shapes allows for increased creativity and personalisation in the game as each time it is played the children can create their own board which also makes the game different each time it is played, increasing replayability.

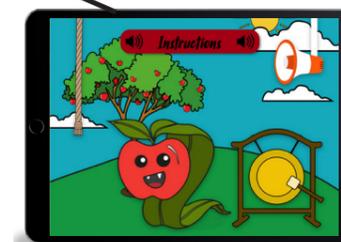
- Through user testing, 100% of users loved playing the game and a number wished to continue even after the allocated testing time had lapsed.

Weight (Touch Aesthetics) - The board game has been made to ensure that the youngest target audience is able to carry the product safely.

Sound (Sound Aesthetics) - As the product is mostly a board game there is not much sound involved, however on the app, where possible, sound feedback has/will be included to help lead the user through tasks. However, for the prototype this has only been included for auditory instructions due to the limitations of the prototyping software. It is intended that in the final manufactured product there would be sound effects for when the majority of buttons are pressed to ensure clear feedback and to engage the child more.

Final Outcome:

This button allows users to have instructions repeated during game play.



Ensuring the game is desirable and engaging for children by including sounds and saturated colours the game where possible was key. By including other elements like the creation of their own board, increasing replayability, makes the game stand out more for children as well as the exploratory theme of the game. These elements all evoke excitement and engagement with the game as well as appreciation through the senses.

Image 17: Screenshot of app pages to show sound embedded.

Eliminating Elements

'Like everything in design, less is more' (Yablonski, 2016), in this context, originally, the app contained more steps that were also more challenging for the user to set the game up, through user testing these steps were reduced and eliminated where possible.

Metaphorical Affordance

The use of buttons (icons) is very commonplace in apps and are associated with a function/command. 'Affordances determines what actions are possible. Signifiers communicate where the action should take place' (Norman, 2013). In this case the use of a save button is the metaphorical affordance as the symbolism of the graphic means that the game progress will be saved. It is also the signifier as the user understands the action that will follow by pressing it.

Box Weight and Size

As primary school children are expected to 'carry no more than 10-15% of their own body weight' (Dowshen, 2016), when creating the final product the weight and size of the product was monitored and kept in consideration to allow for the lower end of the product's users to still be able to use and access the game safely.

Fine Finger Dexterity

As the main users of the product are children, who have relatively limited dexterity, it was important to ensure that the buttons they had to press were of a suitable size. All buttons were made to be at least 24x24 px big to ensure ease of use for the target user.

Eliminating Tasks

'Whenever possible, it is good to shift [tasks] away from the user and make it easier for them to stay focused on their goal' (Yablonski, 2016). Originally users had to interact with the iPad during or after every turn. Following improvements, players only need to interact with the App when they arrive at checkpoints. This helps to reduce cognitive load.

Saturated Colours

'[Saturated] colours are perceived as more exciting and dynamic' (Lidwell, Holden and Butler, 2010). Using traditional palette colours for the player and board pieces resulted in them being relatively unsaturated and therefore less appealing to the target user. The colours were made more saturated and brighter and through user testing confirmed that the brighter pieces were preferred by the users compared to the changed out ones.

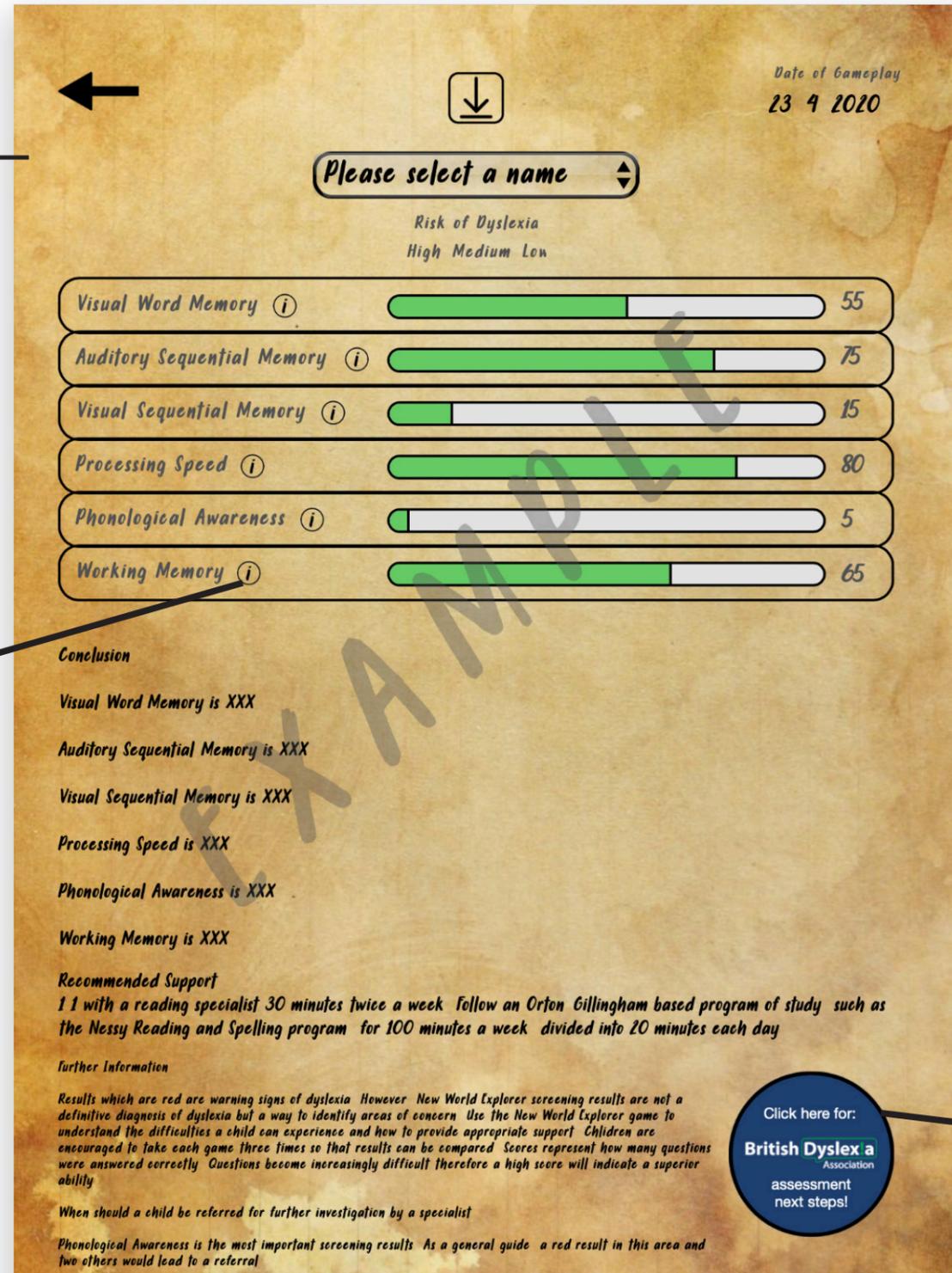


Immediate Feedback

'Feedback must be immediate: even a delay of a tenth of a second can be disconcerting' (Norman, 2013). The aim was to make things as easy as possible for the user. As soon as a child presses the button to exit the game a report gets created instantly and sent to the parents. The concept and what is received is complex, however, the app allows for a simplistic method of receiving the desired information quickly and clearly.

Pattern Affordance & Clarity

'[Pattern] affordance' (Borowska, 2015), allows parents to understand that by clicking on the button they will receive more detailed information about the meaning of the test area. This makes things clearer for them by helping to breakdown and explain jargon.



Stress From Decision Making

If further testing is thought to be appropriate, then this button and the recommended support section will appear to help direct parents and take some of the stress of decision making away.

Personal Design Philosophy

Human centred design can be considered to be a process, mindset and/or approach to solving problems keeping the user at the centre, in particular for those experiencing a specific problem. Personally, as a designer, a human centred design approach is the most important aspect to keep in consideration and encompasses what I aim to accomplish through my design work. The roots of human centred design can be seen in international standards such as BS EN ISO 9241-210:2019, that states the 'approach to systems design and development that aims to make interactive systems more usable by focusing on the use of the system and applying human factors/ergonomics and usability knowledge and techniques' (International Organization for Standardization, 2019). To allow this design philosophy to be fully defined and understood, the key principles that I believe make up this philosophy must be understood.

Primarily the idea that while design can encompass elements of art, design itself is not an art. I believe this is an important point to clarify as art is created to provoke questions, emotions and is open to individual interpretation while not addressing any specific human need beyond expression, whereas design is a process that is used to solve a problem in a creative way. Also, within this I have the belief that a design should be relatively self-explanatory and not be open to ambiguity but rather a guided process of the product. In short, design creates answers to problems, while art creates questions for the onlooker.

Another key principle to consider is how a design can never be perfect. While aiming to create the optimum solution to address a user's needs, it should not be forgotten that humans are complicated and have individual needs, with ever changing expectations and desires. Even with a timeless design a product can meet a users' needs or be the driver for change that consumers didn't know they wanted, so a designer must be flexible and able to amend and adjust designs accordingly.

The question of accessibility is becoming an ever more important aspect for designers, and should not be seen any more as a legal compliance but rather the norm. However, to allow for these considerations, accessibility factors must be incorporated from the beginning, having this sort of empathy can be considered a great skill for a designer to have. To reach their full potential the designer must develop this skill, one of the keyways to do this in particular with a human centred approach is by gaining a deep understanding of the end user and the full purpose of the product itself. To ensure a product

can fulfil its potential the problem area must be rooted in reality, and the user fully understood, or the design decisions are just speculation as to what the designer believes the user wants.

A product should communicate an obvious function to the users, especially if something is so well designed that the function of the product is self-explanatory, or as close to this as possible. Little explanation to the user should be aimed for as the desire for instructions is dying. If a product is not easy to use and interact with (unless this is the purposeful intention) then the product has ultimately failed, despite the aesthetic pleasure that might derive from using it. It can be argued that a good design should be experienced but not necessarily seen – this can be explained by the behind the scene features that makes a product's interactions seamless, instructions instinctive and function undeniable, which ultimately makes the experience delightful.

This leads on to another principle that design should delight. As already discussed, first the function must be determined. However, if a product can also delight the user, whether through form, function, value or a combination of these then a product can be deemed successful. The difficulty with this determinant is that delight is a personal emotion, and this brings back the importance of a designer's empathy.

In today's throwaway society, as a designer, if you can create a product that doesn't get instantly thrown in the bin can this be considered a success? While personally the sustainability, per se, of a product is not at the core of my design philosophy, making a product that lasts and doesn't need to be quickly replaced is very important. The belief is that if you create something that has a real use to the consumer and really solves a problem, apart from the obvious need for the product they will hopefully become emotionally attached to the product and therefore be more reluctant to get rid of it.

I believe the above principles have been demonstrated through the products and processes I have worked on while at university but also in some of the external work I have undertaken for companies for example while on placement at Viacom (now ViacomCBS). My products have been mainly focused on helping families, and trying to make their lives easier, with a particular emphasis on children. Two of my key projects in the second year were human centred projects, firstly, helping manage tantrums while out in public to help make the experience as easy as possible. This involved understanding both users (the parent and child) and how to

most appropriately help them. While the other was helping working parents build a relationship with their child using, one of the most intimate times in a child's routine, bedtime. For both projects consideration needed to be given in terms of accessibility for a child, a self-explanatory interface and ultimately products that delighted both users. Both products have the potential to develop and grow with the child and can be seen as more of a process than a one off use product and thereby being sustainable over time.

'New World Explorer' really encompasses my design philosophy, where I am designing to solve a problem that should alleviate the stress on the child, families and ultimately hopefully also on public services. This product is focused on what the two separate users need from the product and committed to finding a way to bring their two needs together in an accessible way aimed at not making the child feel like they were being tested. While the users have been the focus for this design, ensuring that the form of the product follows its function in a fun and engaging way was also key.

Even through my previous work experiences I have always chosen a more graphic design approach but ultimately the designing of products made for mass consumption has been where my interests lie. Within this the needs and wants of the consumer are always at the centre. Without a comprehensive understanding of your user is it possible to produce products that they want to buy or a service they would like to be involved in? For example during placement, where the company was looking to take a more STEM approach with most of their pre-school shows, a co-worker and I proposed the idea for an education centre that would allow different subjects to be related to different shows and incorporate fun and engagement with education. Within this, the idea of accessibility was central for us and we even suggested having areas for special needs students who also wanted to engage and participate the same as their "normal" counterparts.

To conclude, through the explanation of key principles that I, myself, as a designer try to adhere to with the explanation of some previous projects completed, a greater understanding of my personal design philosophy has hopefully been achieved. A human centred approach to relatively self-explanatory, accessible products that have a longer term use while trying to aid and simplify the users' lives is at the core of my designs.

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Appendix

Appendix A - User testing

The majority of user testing was carried out with young children at a school, as a result no evidence through photos or videos was allowed to be taken. Instead There is photo/video evidence of user testing with some older participants and the notes taken from all user testing sessions including with the children.



Screenshot from one of two user testing videos, to see full videos (approx 1hr each) please contact me.

Images of user testing game play.

... don't go what you want to test beyond a set value, useful & meaningful look & feel is desirable

Goals/Personas - what do you want out of the testing?

Tasks - identify what tasks concerns relate to

Scenarios - embed tasks in realistic scenarios

Questions - identify gaps & ask users about tasks

... with the children play the game & after explaining how to play and see how well they play it & ask after the game what they liked most about the game etc...

4 steps = effective plan

- identify appropriate focus
- execute & analyse all feedback & refine prototype
- repeat process

User Testing Plan

Concerns

- is the format too complicated for the appropriate user?
- does the game engage the child enough?
- does it allow the parent to feel worried that they will get "detailed information"?

Tasks

- The user is to play the game without the feeling of being tested, in a fun way
- The parent of the user should receive an easy to read report that would help identify if their child has dyslexia and if they do where to go for help & next steps

Scenarios

A parent has doubts that their child might have dyslexia at school but not sure why and the teachers haven't said anything. So the parent buys this game and plays it as a family with both their children. Once the game is complete the parent receives on their phone a report for each child and where they are doing well and struggling and what to do next.

Questions:

- To child: does the game make sense? did you enjoy it? what was your favourite part of game?
- To parent: did you say any improvements to the game? did the report you feel like you can help your child?

Board Game Testing 23.01.2020

7 points - Plane gain 2 explorer cards
5 points - Train gain an explorer card
3 points - Car
1 point - Walk lose a turn

Youngest player starts

points - slider
- iPad

hvision - app prototyping software

Bullen - 44
Blackburn - 40
Will - 34
Luke - 42
Samuel - 43

- lose some points or lose a turn
- more positive cards ratio
- one dice
- where to track points - is it too complicated?
- travel tickets doesn't cost a turn
↳ so two goes in one

13/02/2020

User Testing - Liv

Make your own board
↳ 2min 56 secs

↳ 2 player game

★ Add codes to each route card

Came starts 3:20pm → 3:40pm
↳ reduced app play

- Pass over compass = 1 explorer card
- Stop on compass = 2 explorer cards
- Can only use explorer card before dice roll
- Explorer cards on show
- Only explorer card used put back in pile
- Task 6 - make number sequences 3rd & then 4th

- simplify app → Liv's design

- make user journey for app set up

18/02/2020

User Testing - Testy House 18/02/2020

Build own board
↳ set up = 2min 10secs

• reduce numbers on Task 6

19/02/2020

✱ Azure prototyping software
↳ not developers software so can't send things externally
e.g. parent's report or contact us form

✱ Azure just shows what would look like then could get sent to developer to make fully functioning

Newbarnes Primary School 17/03/2020

User Testing

4x Yr 2 (7yrs old)

Building board → 2min 56secs

- ↳ Teaching someone else more fun
- ↳ didn't feel like being tested
- ↳ fun & really enjoyed & liked the graphics
- ↳ 3/4 like the self make board
- ↳ explorer cards good

4x ~~Yr 2~~ Yr 3

Building board → 2mins 9secs

Quest 6 - can't see numbers cause just learn/read them backwards

- liked the game
- liked the fact can build own board
- can have a one person version
- add footpaths
- add compasses on land too

