Design of the drawing canvas for the NMA app.

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# Introduction

Although there are not much relevant studies done particularly on a drawing app for children, much of this report will be based on my own experiences of working with, creating designs for and bringing up children. Further to this, the drawing page needs to be designed in such a way that it can cater to the youngest of children, but still have features that older children or adults may like. The app needs to closely mimic the features they would find to drawing on paper.

This isn’t an app that needs to sell itself and reach a million downloads from the store.

When it comes to the HCI for this app we need to make it accessible to all ages. Tools will need to be included that older children may use yet hidden in a way that doesn’t invite younger children to try new things. They need to be able to only see and focus on the things they want to use to complete their drawing.

Unfortunately, CCI doesn’t have much research. So much of this report will be based on my own experience and intuition of working with and designing for children over the past 20 years. My experience includes tutoring, running scout groups and various after school clubs, bringing up four children, magic shows and circus acts at children’s parties, being a red coat at Butlin’s, currently I also work with the children’s university promoting both the university and extra-curricular activities. I also met a toy designer from Tomy once that said he had three mantras for knowing a toy is right:

1. The younger the child it’s made for, the more children can play with it.
2. If it looks like it was made by a child, children will love it.
3. The more sense it makes, the less fun it is.

# Use case for the Drawing Interface

The use case for the drawing interface is that children of all ages are presented with the tablet and given the instruction “Draw the National Marine Park”. In my experience with this case, as children are handed the tablet, they will generally formulate the picture in their head, then quickly scan the interface to find the tolls they would normally use to draw, then start drawing. The fundamentals to this type of use case should include the following:

* Exciting and fun
* Colourful
* Simple
* Have the tools that children may use to complete a drawing.
* Try to avoid exploration of the app:
  + The children should recognise the tools they want to use and not be attracted to tools they may be using for the first time.
  + Tools for younger children should stand out more than the more advanced tools used but the more advanced children.

# General Observations of Children’s Drawing

The first consideration for the drawing part is to make it accessible to the youngest children without giving them all the options, yet still having all the options available and visible to older children and adults.

According to Tanja McIlroy development of kids drawing goes through these phases (McIlroy, 2022):

1. 12 Months: Random Marks and Scribbling
2. 2 years: Controlled Scribbles
3. 3 Years: Basic Shapes
4. 4 Years: Patterns and ‘Tadpole’ people
5. 5 Years: Pictures and Portraits
6. 6 Years: Drawings represent Interests and Experience

Also stated though is that children do develop at different paces and the ages here are generalised.

Something that I have noticed though is that when children do start drawing shapes, unlike an older child or adult, they will draw the outline in a colour rather than a pencil or black pen. It would seem that at some point, probably the introduction of graphite pencils to them, where they can erase will they start to draw outlines for everything then colour accordingly. This happens at around the pictures and portraits stage of their drawing development.

It’s difficult to find any relevant studies into the technicalities of the way children draw, how they draw, rather than what they draw. The youngest children have no concept of erasing for instance, since the crayons, coloured pencils and pens, just aren’t erasable. If they make a mistake, they either don’t notice it or don’t care about it, and simply carry on.

# Looking at Children Drawing on Tablets

I asked some friends and family with children to draw on some tablets just to see what kind of tools they use. The observations were as follows:

## Brushes

Mostly, the children used the default brush throughout their drawing.

## Colours

As expected, the younger ones seem to draw in the colour of the thing they were drawing, whereas older ones generally drew a black outline and filled it in

## Shapes

Only one used any kind of shape tool and they drew a house using a square and a triangle and then went to a brush to decorate the house.

## Eraser

Eraser was either never used, or used frequently, especially with the older children.

## Fill

This was a surprising one for me and something I had seen before in some videos but not something I’d ever used. Basically, as you draw your shape, it fills as you go. Having a go with it myself I found it very hard to use initially, but quickly understood it. But seeing what some of the children did with it was very good. When asked to draw without this feature, the children simply drew outlines and didn’t even attempt to colour anything in. When questioned on this, the responses were that they didn’t like colouring in that way because it’s more difficult. This is a tool that once you are used to, it is hard to go back.

From this it seems we should have all the features instead of the shapes.

# Designing the icons for the Buttons

## Colours

Colours on the observed apps seemed to be hidden behind a menu for the most part. Others had an array of coloured pencils or pens in a drawer. For the purposes of our app, I think adding them straight to the screen would be a better option, to allow for that quick scan for the tools they need and avoiding them exploring the app. Also the avoidance of different brushes for the reason that from observation, the children only use one, a simple circle representing the available colours should be sufficient for the use case. To add a little fun, the selected colour could use some kind of splodge for the selection indicator.

## Stroke width

Again, this is something normally hidden behind a menu of some kind. And again, this is something we want to try and avoid, since if things are hidden behind menus, it will invite children to try all the menus to see what’s behind them and start exploring things rather than drawing.

Providing a slider is one option, although this may also invite some of the older children to start fine tuning, so having a simple selection of a few stroke width’s should be sufficient that they have the option, but not enable them to think about it too much. For the purposes of this app, a simple squiggle in various widths as icons across the top of the canvas should be a reasonable starting point.

## Eraser

There seems to be two things that children recognise as an eraser. The first is the pencil top eraser that can be recognised as a simple dome shaped, fleshy coloured thing on top of a silver band, or alternatively the blue and fleshy coloured erasers with the white band, which on various school visits I have noticed they seem to be quite popular.

A picture containing text

Description automatically generated

Combining the colours if the eraser to the shape of the pencil eraser and that end of a pencil will provide the broadest recognition to the eraser.

## Fill Brush

The only way that I have observed this being implemented simply, is by having two freestyle splodge like icons, by that I mean no predefined shape, one that is filled and one that is an outline.



This should represent the best starting point for the drawing interface.

# Ergonomics

Given that when you give a child a tablet and ask them to do something on it, they will generally freeze in what ever position they are in, be it sitting or standing. Sitting isn’t too bad as they can just rest the tablet on their lap. Standing however is a bit of a different story. When standing they will hold the tablet without resting. Because the tablet is quite heavy and smaller hands will have less leverage on the tablet, they may get strained fairly quickly. This is the reason the colours are on the left side of the screen. Right handers will grab the tablet with their left hand, drawing with their right. The hope is that when they change colour, I have noticed that other applications for tablets generally have some kind of selection on the left side too. Therefore, when children do need to select something it does give them that brief opportunity every so often to grab the tablet with both hands and they will slide their offhand up and down to select an item with their thumb. The same is true of left handers, only they will use their dominant hand to select one of those with their thumb.

# Hiding things in plain sight

The biggest challenge in creating the drawing interface for this app will be having all the features visible to everyone, but hidden from those that won’t want to use them. The key to this is styling them slightly differently. When designing posters encouraging children to join beaver and cubs, we would design a few different posters trying to attract them with different activities, sports, survival, and being outdoors. The feedback we got from one parent was that their child was put off by two of the activities and wasn’t keen on attending. So, we redesigned all the posters giving them all different styles of drawing, text, colour, and logos. This worked quite well, and we did see a slight uptick in new members. So, designing the drawing interface to incorporate different styles for the different advancements in tools may help to blind those that don’t need them.

# Designing the App for the Youngest of Drawers

For the youngest of drawers, because they draw with only crayons or coloured pencils generally, I believe it is safe to assume that just having a colour palette will be sufficient. Keeping the colours bright will help it be more attractive to children, I have chosen twelve colours, basically from the twelve points of the colour wheel, however I have removed two of the red colours and replaced them with more shades of green and blue since our eyes are more sensitive to those colours and are more in line with the things they are likely to draw at the aquarium.

So, for those children simply having a colour selection and the canvas should suffice. A picture containing shape

Description automatically generated

# Adding features for the intermediate Drawers

The tool I think that are required for the more intermediate drawers will be the stroke size and the eraser. The trick here though is to add the buttons in a way that the youngest won’t recognise and ignore them.

Adding them at the top of the screen does separate them from the colours nicely, but they feel like they have the same importance

Graphical user interface, text

Description automatically generated with medium confidence

However, having the colours and the stroke width buttons separated by a lines from the canvas like this does convey that there are buttons above and could entice the younger users to explore the buttons. Removing the line separating the colours from the canvas should help the younger users focus more on just using the colours.

Graphical user interface, text, application

Description automatically generated

Here, the strokes do look more separate from the canvas than the colours, I have designed to look a little reminiscent of an “S” for the purpose that to a child that doesn’t recognise them as stroke widths, will dismiss them as text, however the button nature of them does make them all a bit inviting.

Graphical user interface, application

Description automatically generated

Squishing them up a little and removing the rings makes them less obvious to a younger child that they are buttons, though the selection circle should make them a little more obvious as a point of selection for those that recognise them as stroke widths. I have gone for a different colour here than the save drawing button since having it blue I believe will make it feel like something will pop up, rather than be a selection.

## Adding the more Advanced Buttons

For the more advanced buttons, The fill and the eraser which seems like the next step in advancement of users, Anything that’s put above that line now should be relatively ignored by the youngest. We also are safe in the knowledge that children will be given the tablet and asked to draw The National Marine Park. So they will be in that mode of knowing what to draw, rather than being in a more exploratory frame of mind. Because of this they will quickly scan the interface for things that they recognise and generally ignore anything else for the duration of their drawing. If this were to be an app that they download and are going to use to develop their drawing skills in their own time, they will likely start with what they know and then progress to exploring more features as they advance in their skills. As a part of this app it is important that the interface doesn’t invite any experimentation and is used by each visitor to quickly make a drawing, but also allowing them access to all the tools that they may want to use. So somehow, they need to again be slightly less obvious and hidden from anything on the screen so far. Being in the top left corner would seem like the best choice as this is generally where a logo would go, and due to the nature of the icons, if they are not instantly recognisable as the tools they are, they should be dismissed as a logo or at least something to never look at again after that initial scan.

Graphical user interface, text, application

Description automatically generated

So here the eraser icon is based with the classic colours of those blue and flesh coloured erasers with either a white strip or band combined with the shape of a pencil top. All the icons are different in shape and colour and the selector tint doesn’t quite match the size of the icons. This will be explained in the next section.

# Looking Through the Eyes of the Users

As the users are going to be given the tablet and asked to draw The National Marine Park, Because that instruction is their focus rather than the drawing app. Rather than looking at the whole thing and taking everything in, they should just give it a quick scan and recognise the relevant tools and buttons.

Everything not relevant should just be dismissed and a blur in their periphery So the least developed should see this:

Graphical user interface, application, Teams

Description automatically generated

The next level of development should just see this:

Graphical user interface, application

Description automatically generated

# Other Design choices Explored.

In discussions with the client, one thing that was discussed was having different interfaces that would come up depending on the child’s age. This was dismissed since children can develop at different ages and even some adults may just be happy with the most simple interface.

Another design discussed was having the more advanced tools in some kind of slide out or menu button. This was dismissed as it invites exploration a little more, especially if they didn’t find what they were looking for on that initial scan.

# Summative Assessment

I sent copies of the interface design to various friends that had children and asked them to recognise the elements that would be relevant to them. For example, the older children that use the fill stroke were asked to recognise the icon for that tool. It wasn’t relevant to ask them to recognise tools that they wouldn’t use. The feedback that came back was that everyone recognised the icons relevant to how they would use the interface.

# Testing at the Aquarium

The tablet was handed to the Aquarium for them to test wit visitors for a couple of hours on a Saturday. The results that can back were also positive. None of the visitors asked any questions about using the app and everyone that did use it found the tools they needed and no one seemed to explore any of the tools they didn’t recognise. Although this was a fairly small test with just under 20 tests undertaken, No issues were discovered.

The Aquarium has now had the tablet for a week and has been letting visitors draw with the app. Feedback will be discussed when the tablet is collected.