

Calculator Application

Shannon MacTaggart
Art 337 Interaction Design

Project Presentation

Goals:

Create an app that helps children grades 1st - 6th with basic addition, subtraction, multiplication and division problems

Have app be simple enough that a 6 year old can operate on their own

Help children to subcontiously work on their cognative and motory skills through reading, grouping and color exposure.

User Tests:

User test showed key areas that needed to be fixed such as simplifying the app and have it clearly give direction. Also the bright final presentation of the app with a simple background, but fun colors all over to make the app happy and engaging.

Final Conclusion:

App helps children to learn to become comprehensive with their basic math skills while still doing it within a fun enviornment that also will help child solve the problems and encourage positive emotions.

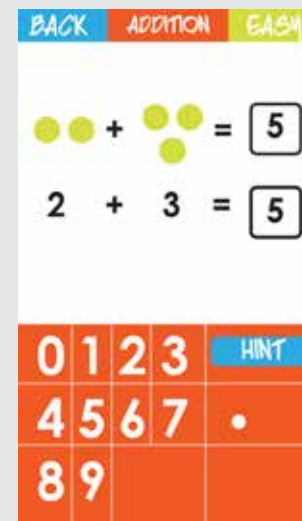
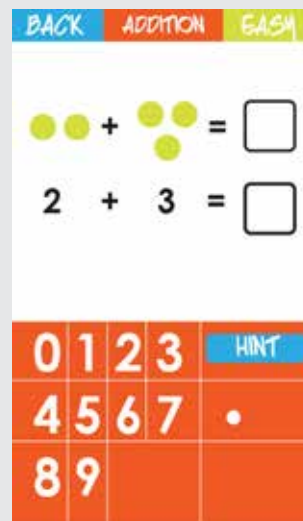
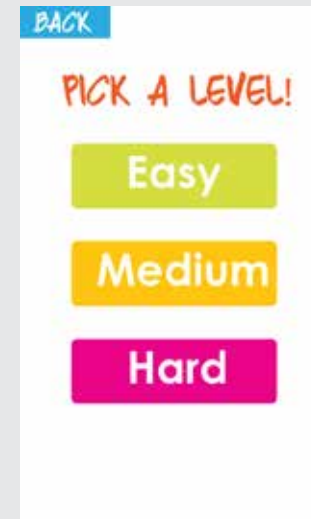


Table of Contents

Part 1: Define the Problem.....	3
Part 2: Research.....	4
Part 3: Choose Project Topic.....	7
Part 4: Brainstorm/Test Topic.....	8
Part 5: Develop Interaction and Form....	13
Part 6: Refine Interaction and Form.....	15
Part 7: Final Rendering.....	21

Define the Problem

Project Requirements:

- Design for smart phone screen size
- Design both portrait and landscape versions
- Design 5 to 10 screens to demonstrate functionality

Goal:

Create an app that can effectively help children basic math skills using addition, subtraction, multiplication and division.

Questions:

How much value have you added to a smartphone calculator?

- I have added value because there is now a calculator that can help children effectively learn basic math in a fun and inviting way.

What calculator functions have you kept?
Why?

- Addition, Subtraction, Multiplication, Division. Because they are basic calculations that kids need to learn.

What functions have you eliminated?

Why?

- I eliminated the % +/- and clear buttons because they kids won't need to use those as it helps calculate and see if they have the right answer generated in the code that makes the app.

What functions have you modified? How?

Why?

Word Problems, dragging fruit from bucket. Because it helps with sensory and motor skills of children.

What is a smartphone capable of doing?

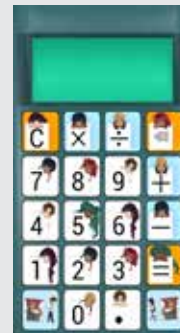
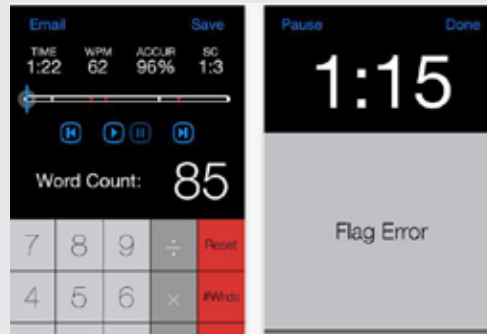
- GPS
- Storage
- Security
- Camera
- Phone
- Texting
- Voice Commands
- Swiping on screen
- Display

Research

Visual Research Summary:

Conducting research on the history, basics and what make a calculator functional. For the research I also have been looking at what makes smartphones tick and so successful. Also seeing how creating an app for children to learn how to do basic calculations such as addition, subtraction, multiplication and division using the smartphone technology.

I also have found that it needs to have a pleasant experience and not necessarily have the look of a calculator. The app needs to have a sense of fun and child like play in order for the children to feel like they are playing, but also at the same time learn. Looking into the history I have with working with a child's motor skills and looking at what others have done for apps in the past, gives a good sense of what my goals need to be for creating this child calculator app.



Research



Research



Subject Choice

Subject Choice Summary:

For choosing what subject to work into the calculator app project, I decided to work on a child calculator app that helps children from 1st Grade - 6th Grade better learn addition, subtraction, multiplication and division.

To also help with this process I've created several word maps to get an idea of what I would want to use as a theme to make the app inviting for children, but also learn the goals that I would want the children to get out of the app, both design appealing and that it delivers what the parents of the children would want in them learning how to effectively do mathematic equations.



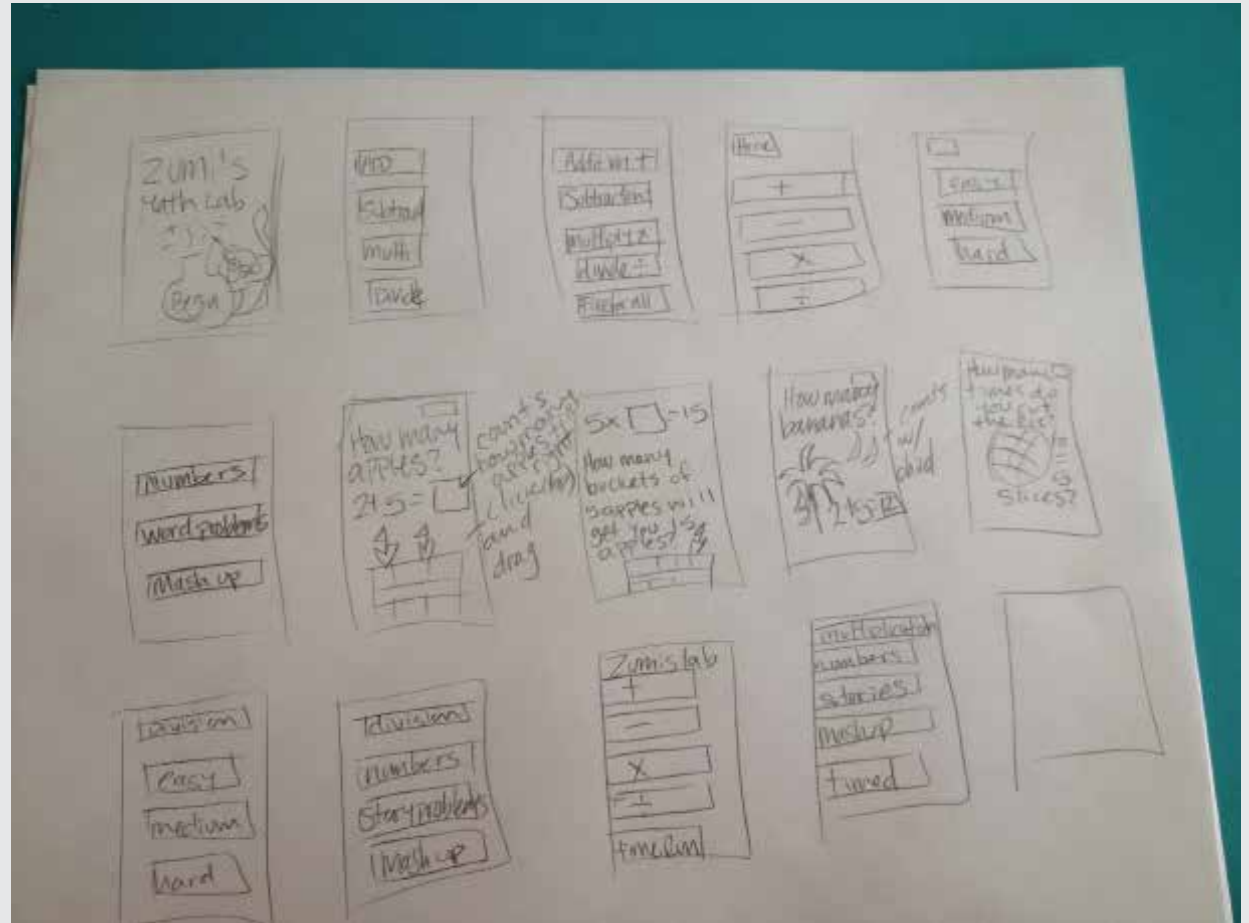
Brainstorm

Brainstorm Summary:

I created several sketches of basic processes that would happen within the app. I made steps of how they would get through each step to either do multiplication, addition, subtraction or division.

I found through this process since I have a slightly large audience area for the children's age range, I decided to also add in a "easy, medium, hard" part when they choose which kind of math problems they want to do.

It will then allow the app to shuffle out the easier problems and the children can choose through the different levels. Then they are to go to one last page which allows them to pick just equations, or word problems or a mixture of both. I also put in a timed test for fun that they can test how quickly they are able to solve problems.



General Audience

Personas Summary:

After selecting out some ideas of what the app may look like and how I could design the different math problems, I decided to make several personas to better help understand the age group.

I decided to make a boy and a girl to see what would happen also with the gender differences. Hailey is age 6 and in 1st Grade while Jordan is age 10 and going into fourth grade.

I chose these ages because one starts at the beginning and by fourth grade many students have a good grasp of basic mathematics and it would work for that age range different between 10-12 which is grades 4th-6th grade.



Name: Hailey
Gender: Female
Age: 6

Favorite Color: Pink

History:

Hailey is a little 6 year old in first grade at foothill elementary. She loves to learn and is a very bright and creative child. But she struggles in math, especially with word problems. She is really good at addition, but she isn't the best with subtraction.



Name: Jordan
Gender: Male
Age: 10

Favorite Color: Lime Green

History: Jordan is a 10 year old student at foothill elementary and he is in fourth grade. He loves reading and playing soccer with his friends. He also likes monkeys as his favorite critter. Jordan is excellent at Addition and subtraction, but he's just learning multiplication and division. He could use a little extra practice outside of school, but he's not very motivated. But he loves it when he's learning, but also get to play and explore.

User Test 1.0

User Test 1.0 Summary:

This is the first round of user testing using some paper prototypes to see how the idea of the app would work and what problems would happen right off the start, especially since there isn't a real set to the design yet for the child calculator app.

Senario 1:

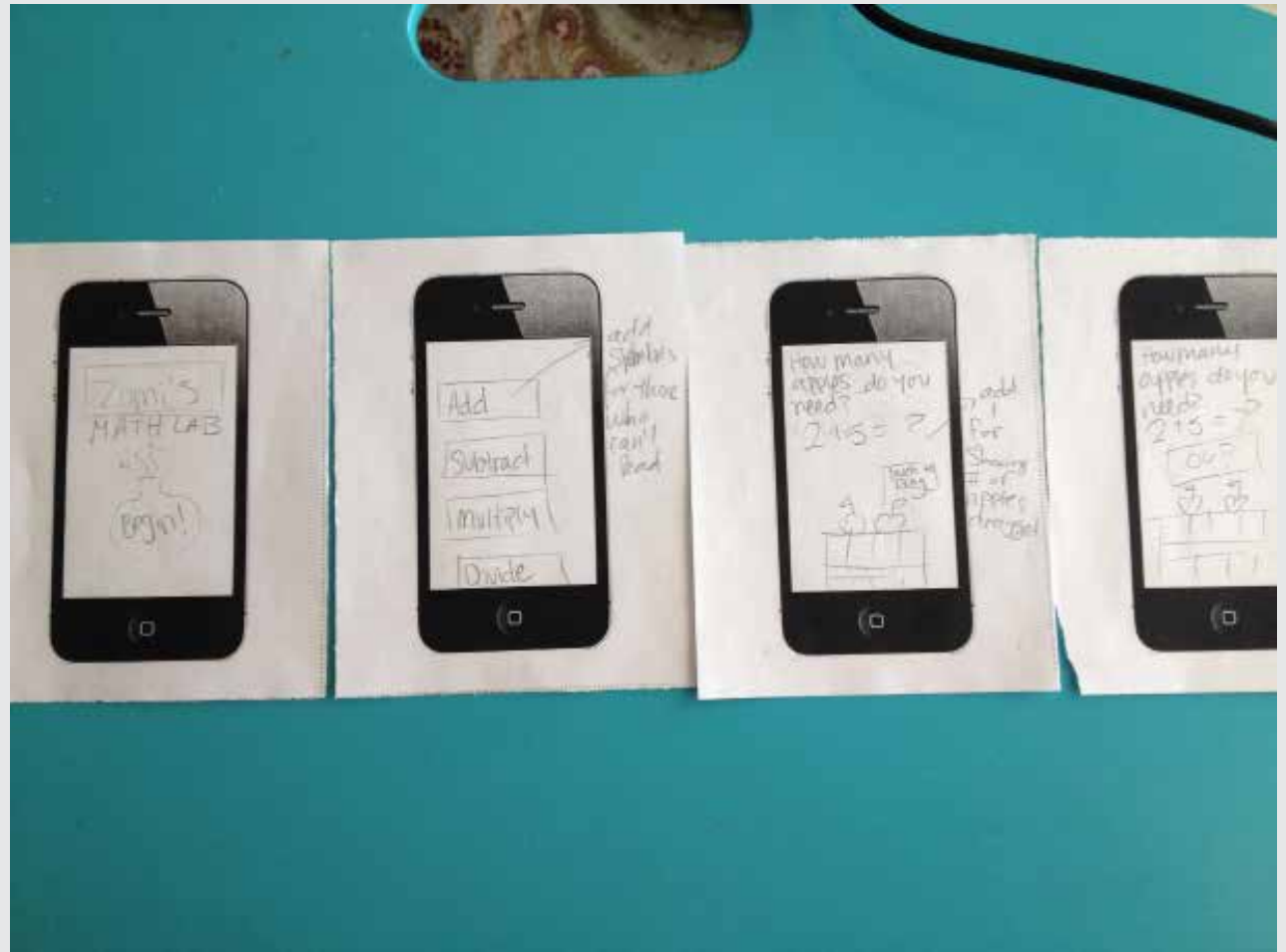
Open the calculator app, and go do a simple addition problem.

Senario 2:

Open the calculator app and perform a difficult subtraction problem

Senario 3:

Open the calculator app and do a timed test using addition on a simple level.

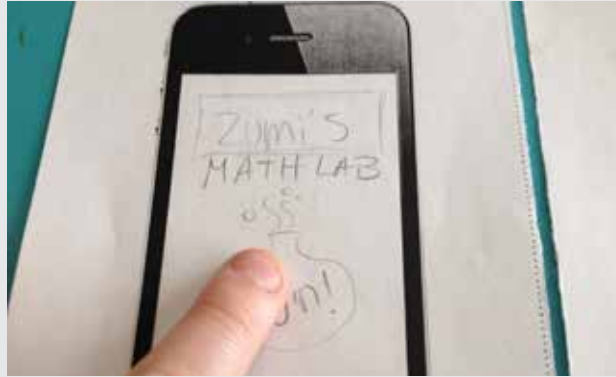


User Test 1.0

Summary of User Test:

After conducting a user test with three different people a few things were figured out that may make the app slightly difficult for children to use. I understood that not all of the children may be able to fully read. But should recognize the symbols and I'm going to add those in next to the words. Also since they can read I'll be using colors for "easy, medium, and hard" so that they understand the degrees of the levels and their difficulty. I may even had the app say the word when they tapp on it and choose that level so they hear the word as well to help with their listening skills that will help them be able to learn the words better.

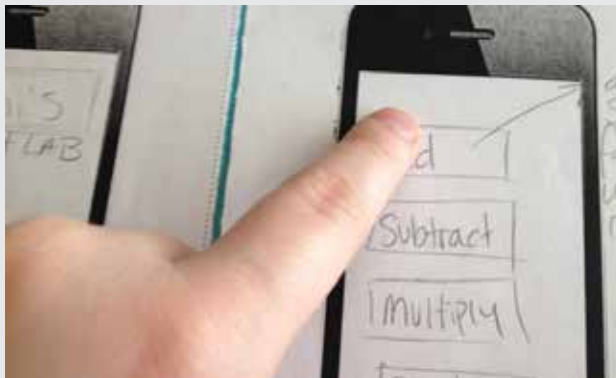
Also no indication of how to do a timed test with any of the equations.



This user test, the user was to go through the senario of understanding how to get to the multiplication problem, pick a level of hardness and what kind of problems they wanted to do, then also perform a problem.

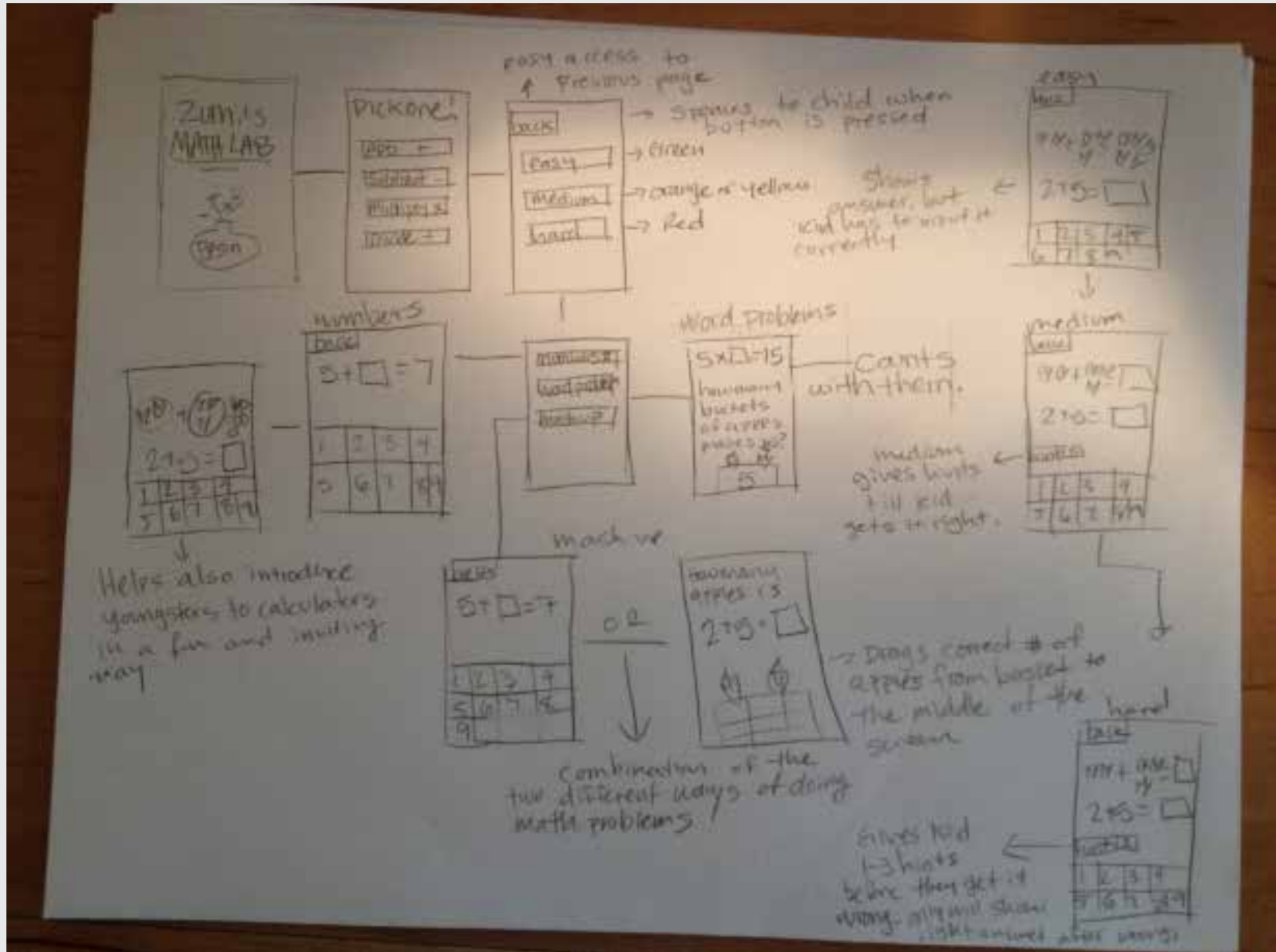


In another user's test they were to be able to at least make it into the app, pick the addition section and the hardness of the level that they wanted to do.



In this last user test, the user was to at least be able to get through a full addition problem on the app, by reading the story problem.

Wireframes 1.0



General Audience 2.0

General Audience Summary:

Getting some needed feedback after the first user test was very helpful. Realizing that because I hadn't quite conducted a study that could make some personas so specific, I decided to go a bit more broad for my app.

The general audience is children in 1st - 6th grade, or the ages of 6-12 years old.

So I found I need to make my app simple and inviting, yet not too complicated for a 6 year old to understand it, but also allow a 12 year old to not feel like they are playing with a child's toy that is too young for them.

General Audience:

1st- 6th grade students
Ages 6-12 years

User Test 2.0 & 3.0

User Test 2.0 & 3.0 Summary:

For the second set of user testing, I have refined the scenarios and expanded on the paper prototypes to have them be larger and fix some of the previous problems such as reading and using symbols so that the kids would be able to operate the cards

Scenario 1:

You want to work on some simple math problems. Pick the simplest level for subtraction problems.

Scenario 2:

You've gotten pretty good at your addition problems and you want to test yourself.

Find the second hardest level for the timed trial.

Scenario 3:

You want to work on harder division problems, navigate from the simplest division level to the hardest level.



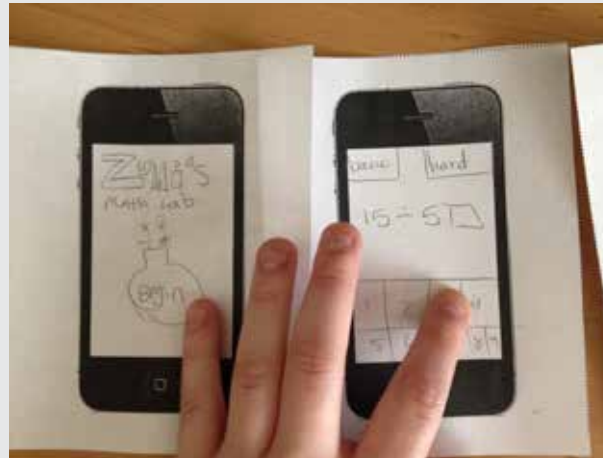
User Test 2.0 & 3.0

User Test 2.0 & 3.0 Summary:

Summary of User Tests:

After conducting these tests with six different people, I have found that the process of the app is very straightforward. It's simple to navigate and that they all were able to understand it. I even had some children who are locals play with the paper apps. His name is Jackson and he said that it was very easy to navigate especially because he plays with an iPhone all the time.

He did ask me if I was going to make this a real app because he wanted to see what it looked like with colors.



This user got through the problem of finding the subtraction, they like how it looks and that the interface is very simple. They said that the symbols are a nice touch for kids who are still struggling to read.



This user was able to get through a division scenario, but said that the division problems seemed very simple for the "hard" level. They need some refinement to demonstrate how the hard level would work better.

Everything was straightforward in terms of how the app worked. It's nice and simple for kids, they would understand the process and it seems like once some colors are added it would be very engaging.

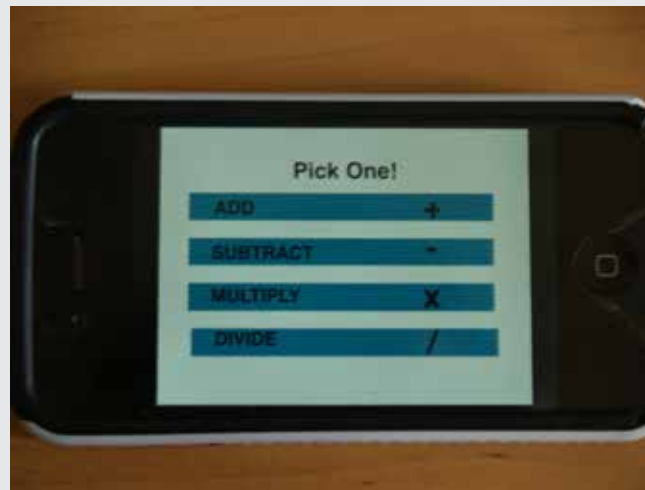
Digital Prototypes 1.0

Digital Prototype Summary:

For the digital prototypes I used a program on my iPhone called keynote to simulate what the app might work like. It also gives a good idea of what the app needs to look like when it comes to text sizes and how big the shapes need to be.

It worked for the most part. There are a few things that make keynote feel limited to being a digital prototype, but it gives a small good idea of how the app needs to work.

The prototype needs a little more work, and probably some better graphics that I create through Illustrator to give a better presentation outlook on how it may actually look besides just barebone images.

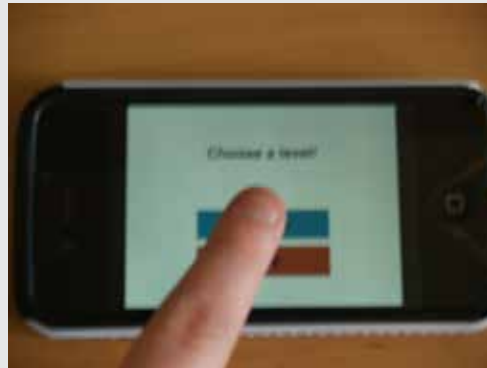
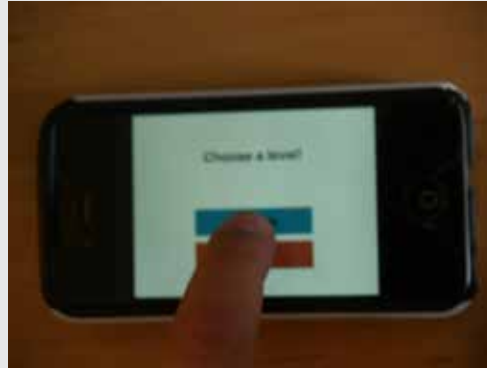


User Test 4.0

Summary of User Tests:

Conducting this test with three users they said it gave a great idea to how the app would work. But it's lacking. Even though it is digital and you get an idea of what it looks like on the phone itself, they said they'd prefer a paper type that would show how it would look and go through it that way since the technology seemed limited trying to do it on the phone.

They like the simplicity of it, it seems like it would be easy to navigate for children, but they wonder how it looks to see how the children would react to the colors more than just how it operates.



Digital Prototype 2.0

Digital Prototype 2.0 Summary:

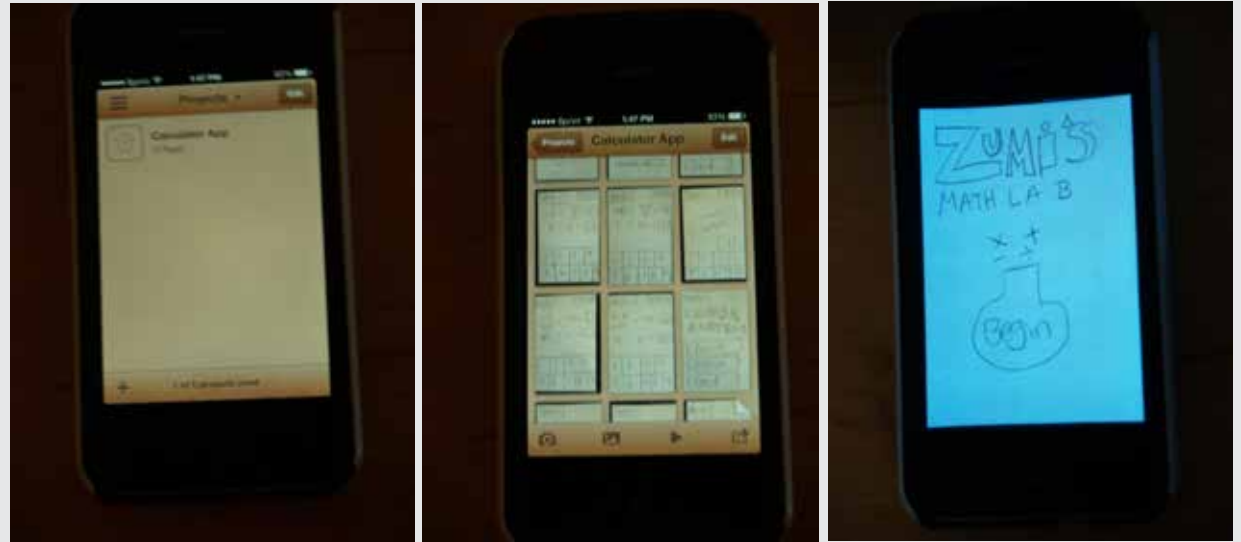
After working in Keynote on my phone for some time, I realized that this kind of prototyping wasn't working out. The users were getting confused and it wasn't doing what I wanted.

So I did some research on Apps that can help with prototyping digitally. I then found a program called POP.

<https://popapp.in>

It is an app for Iphone that allows you to take pictures of your paper wireframes and go in and treat it like a digital prototype adding links to the different images, and it can simulate how the app might work and also gives some basic transitions from each of the different screen peices.

I've found this to be a lot more useful and helpful, it also isn't as confusing for the users to test in the fifth user test that i've conducted and those results are shown below.



User Test 5.0

User Test 5.0 Summary:

Realizing that I need a better prototype, I created one and then went back to the drawing board with the Senarios and I completely changed them up to fix how I have changed the app, because I've gotten rid of a few things such as the timed test and having the differences of doing equations or story problems.

For this one I simplified the senarios as well, because a 6 year old needs to be able to process the senarios to see if they can navigate the app.

Senario 1:

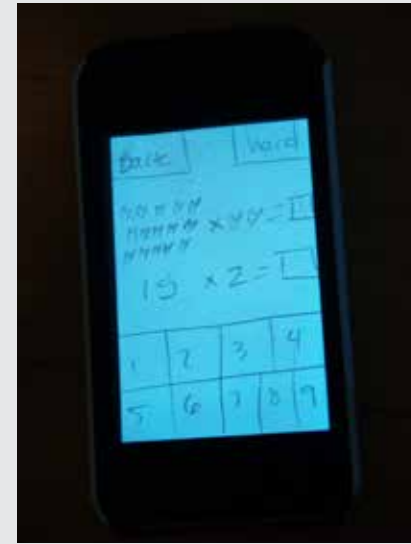
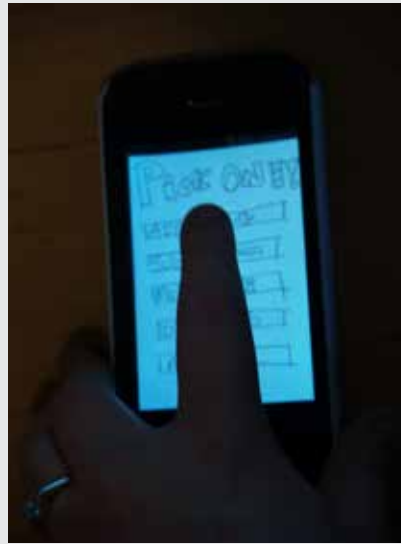
You're practicing your math skills and want to work on addition. Open the app and select the easy addition problems.

Senario 2:

You're practicing your math skills and want to work on subtraction. Open the app and select the medium level subtraction problems.

Senario 3:

You're practicing your math skills and you don't understand how to do a problem. open the app and look for the hint button to learn how to do the problem.



Digital Compositions 1.0

Digital Compositions 1.0 Summary:

The first round of digital comps was a slight flop. I was getting an idea of colors that would work well together as well as testing some fonts and seeing what might work.

I was thinking of having a little mouse named Zumi for it being Zumi's math lab, but I realized it's very distracting and that I needed to simplify the app more as well as work on color and font choices.

The fonts used in this was Arial and Razing.



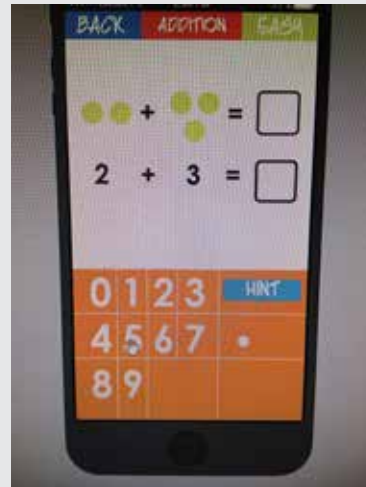
Prototypes 3.0

Prototypes 3.0 Summary:

After trying to use Keynote and finding a successful app that helps make mid-level digital prototypes I took it a step further and found one that allowed me to take my digital comps and make them into a digital mockup.

The site used is called invisionapp.com. It allows me to also use my phone number and they will send it to your phone to be downloaded and you can also work on it from you phone to see how it interacts as well as use it for user testing.

I did some user testing on this, not as extensive, mostly to see how the children liked the colors and positioning of how the app was as well as the helpful objects on top to ehlp show the equation.



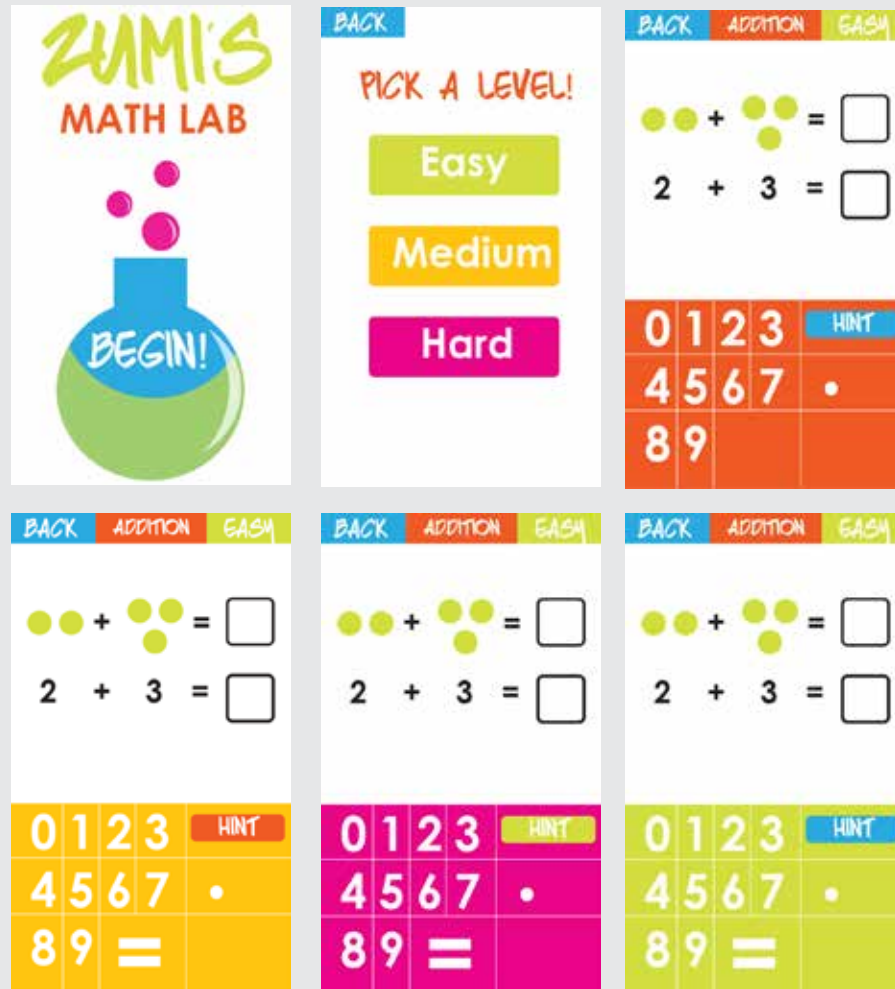
Digital Compositions 2.0

Digital Compositions 2.0 Summary:

I did work with looking at some other fonts such as Century Gothic, Gotham Book and Futura for the static font inside of the app, but I found they were too bulky, and found that Arial bold worked just right for the font weight.

I then moved onto looking at different ideas for colors and I eventually picked 5 base colors to alternate through the app as well as ones that would help figure out the easy, medium and hard levels to give visual representation besides the child having to read the word.

Orange for the calculator was the final decided color because it's still inviting, but it's not as harsh as the other colors are when they cover more area, and the color goal of the app is to be fun and inviting for the children to want to do math in a fun environment.

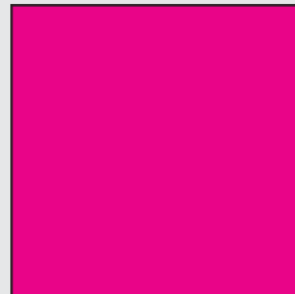
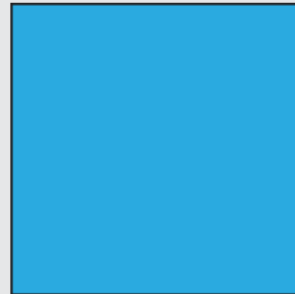
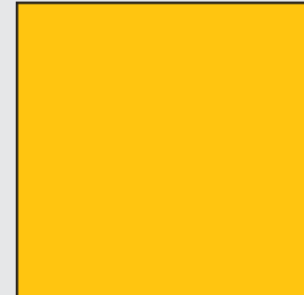
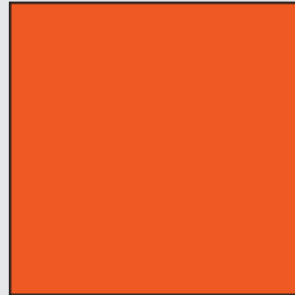


Color Palette

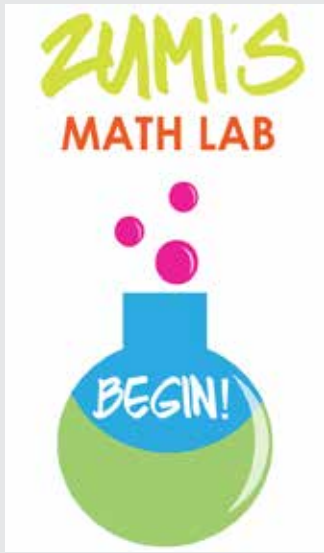
Color Palette Summary:

I chose these colors because they are bright and inviting colors. They are engaging and I could tell from the children that I user tested them with that they enjoy the colors and found them very inviting.

Several of them had their eyes light up when they saw how bright and happy the app was. Some commented that it was like doing math inside of a fun coloring book with all of the bright colors.



Final Compositions



BACK

PICK A LEVEL!

Easy

Medium

Hard

BACK

PICK ONE!


Addition +

Subtraction -

Multiplication x

Division /


BACK ADDITION EASY



2 + 3 =

0	1	2	3	HINT
4	5	6	7	.
8	9			


BACK ADDITION EASY



2 + 3 =

0	1	2	3	HINT
4	5	6	7	.
8	9			


BACK SUBTRACTION MEDIUM



2 - 3 =

0	1	2	3	HINT
4	5	6	7	.
8	9			


BACK SUBTRACTION MEDIUM



2 + 3 =

0	1	2	3	HINT
4	5	6	7	.
8	9	=		


BACK MULTIPLICATION HARD



2 x 3 =

0	1	2	3	HINT
4	5	6	7	.
8	9	=		


BACK MULTIPLICATION HARD



2 x 3 =

0	1	2	3	HINT
4	5	6	7	.
8	9	=		

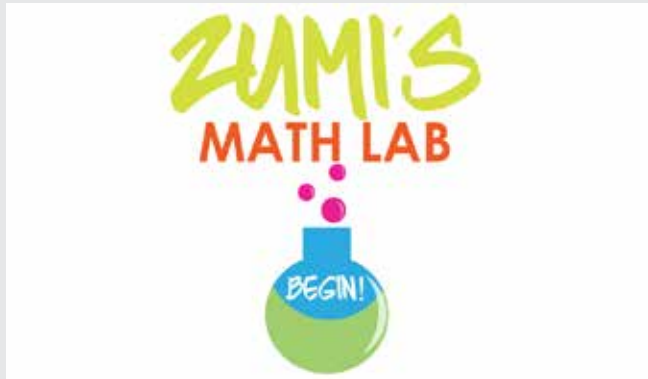
BACK MULTIPLICATION HARD



2 x 3 =

0	1	2	3	HINT
4	5	6	7	.
8	9	=		

Final Compositions



HINT				BACK	ADDITION	EASY
0	1	2	3	Hint: $\bullet + \bullet = \square$ $2 + 2 + 2 = ?$ $2 + 3 = \square$		
4	5	6	7			
8	9	.	=			

HINT				BACK	ADDITION	EASY
0	1	2	3	$\bullet + \bullet = \square$		
4	5	6	7	$2 + 3 = \square$		
8	9	.	=			

Final Project Summary

Project Summary:

This project has overall been very rewarding. There were a few challenges that went into this, such as finding good prototype apps to help test the functionality, but that was overcome by a little research.

I also expounded on the app and mixed my user testing by using adults and children, but I also have a background history of child care, and this project fits a lot of those requirements regarding motor skills that are essential to a child's development.

This project was rewarding in better understanding user testing to make a fun but simple app to help children understand math better in an inviting environment.

