Pitch 2: Full Conceptual Design

Design Goals

The focus or learning topic of our project is to aid individuals in learning how to type. Typing is essential as technology grows. Schools and work use computers to get tasks done and it is essential that students are taught how to be very efficient at typing. Especially when it comes to things like coding or writing papers, this skill is important. As we researched, we discovered some students struggle with learning different symbols on the keyboard. We want to create a tangible interface that can help people understand the different letters and symbols while aiding them in achieving a way to type faster.

We want to see if individuals who have not learned how to type or learned the keyboard yet improve on our device. We would see how they did at the very beginning without any learning. After we would like to see an improved time it took to complete filling in the keyboard as well as if this helps a person learn to type compared to someone who was not using our device.

When it comes to narrowing our choice of design we decided the design where we make a full keyboard using the Laser cutter to cut the keys into separate pieces. We laser cut the keys separately and have a separate board. When the key is placed into the keyboard, a buzzer would indicate if the user placed the key in the wrong spot. It could also be used where the keyboard has all of the keys in the board but is randomly mixed up and the user has to go through and fix the location of the keys and which symbols share a key. This design seems to be the most reasonable to make because it helps the students in memorizing the keys. We have considered how we can implement other layouts of a keyboard using the Dvorak keyboard layout to teach other layouts to students and add variety. With the Dvorak keyboard, it was designed for speed typing and the middle row of keys includes the most common letters. This may be more difficult to implement. We also got feedback on how we can expand on our idea to go further in teaching different topics that we can use with the help of the keyboard, rather than just teach students how to type. Our potential investors include elementary and middle schools who are trying to teach students how to type. Another investor is the elderly who need assistance in learning how to type efficiently. Our ideas complement existing activities because we are planning to use a tangible keyboard to allow the users to learn but in addition to that, we need to provide feedback. When it comes to who our stakeholders are going to, we discovered it would range from school systems, teachers, private tutors, parents, home school teachers, computer learning camps.The teachers and parents need to know how to use this technology in case their students or children need help on understanding the material. Over the past we class periods, we received more feedback on how we can implement this design in a more efficient way that ranges from drilling holes at the bottom of the box and have the kids drop them in the bottom as they choose, having something that can identify the color groups that will not get the keys within those groups mixed with other keys of that group and doing so by using the colors on the bottom on the back of each key that will be able to tell if the key is in the wrong place, and it would be easier if we have a tray with raised borders possibly that will have open backs to read the key and 3d printing is best to do this. The best way is to laser cut the keys using acrylic(instead of wood) through etching the key letters and wipe a color over it filling it. This would help the students better understand what keys your particular fingers are supposed to hit

on the keyboard instead of having the keys the same exact color as the color group the keys are in, which would not make placing the keys so easy.

Needfinding

User research

Conducting research on how the students are learning this material involves having the users sit down and work with the keyboard. There are different things that would need to be measured like how fast the students are typing the correct words and the number of strokes that they have. We started by seeing how fast the kids were at writing with actual pen and paper, then timed them with different speed and accuracy examples, and then looked at records to see how well they were doing with assisted keyboard instructions. We would have the students always place their fingers on the middle row of the keyboard and then tracking far they had to reach to press a different key.

Domain Expert

Tracey Latham has been teaching middle school computer classes for over 25 years. Expert feedback on learning task(s):

The most challenging part of teaching how to type?
Getting students to use the correct technique when typing.

Favorite activities to teach how to type?
Dictation, walk around and call letters out and they have to close their eyes and type that letter. Keyboard program EduType. Making them practice.

How to make students type faster?
They need to know the technique first then they work on speed and accuracy. We practice timed writing which gives them their GWAM, Gross Words A Minute.

How often do you find that students have trouble learning the keyboard layout?
The students don't struggle if they take the study methods given. If the students try to cheat themselves by looking at the keyboard and not practicing they struggle more.

Do you feel that students having hands-on experience with a device like this would help the students learn faster?
It could be beneficial for the students to be able to physically touch it since some students learn better that way.

Is there any part of this device that you would change to better suit a student?
The multiple levels are good for the students to progress. The way I teach it I would change the levels how they were laid out since we don't focus as much on the function keys and others that aren't used as often.

What do you think is most difficult for students to learn the keyboard layout and why?

The hardest part of learning the keyboard would probably be the punctuation and symbols because those keys are not used as often.

The need-finding has helped us shape the design goals and concept as we truly understand what was most needed. In our case, we discovered a strong need for students to learn key placement and memorization of keys in order to be efficient and faster. Also, the interview with our domain expert was very useful in understanding student needs.

Design Concept

Our decision as a group was to go with our first design which was the modular keyboard. We decided to choose this design because we thought it was the most obtainable design as well as the easiest to create with what we wanted to do. Also with the other options, they required us to run more wiring components, there would be no room for the Arduino, and the flatter keyboard would add more of a struggle for the users. We had to choose between a couple of different designs that we had come up with and decided on having our LCD screen on the left side because we thought it looked the best as well as allowing us to house our Arduino there and make the design look clean and not bulky.

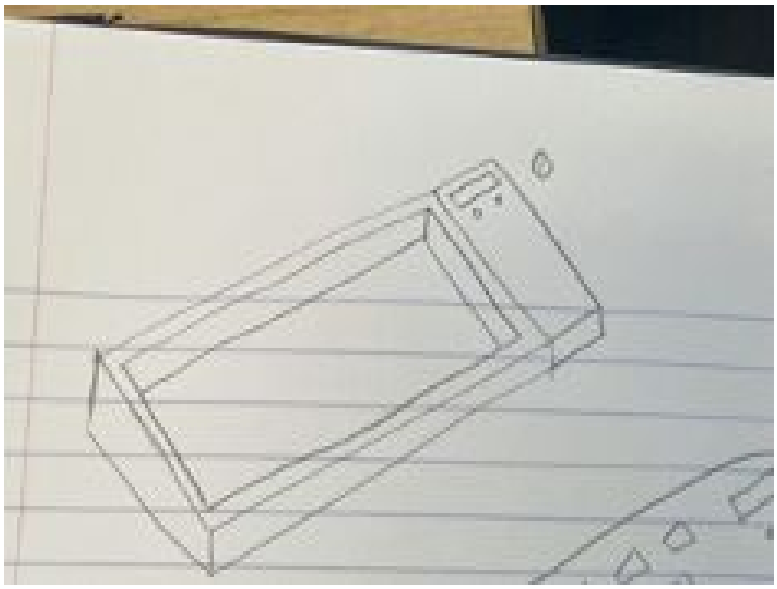
When we were searching for different design precedents, we found a couple of interfaces that heavily influenced our decision to go create these designs and further help in our decision. We first found an interface by the name of Keyboard Puzzle. Learners first design the layout of the keyboard. Then using a laser cutter, they can create the puzzle. The third step is removing keys from an old keyboard which then can help the users learn placements. It is relevant to our design concept because we have a similar idea to create a puzzle-like keyboard. Our design concept will differ because we will indicate if the user places the keys in the correct spot. Also, the user will already have the key pieces and a keyboard layout, whereas this activity requires the user to go through all steps of even creating a keyboard. Another precedent is EduType. This is a program that many schools and school systems use to help teach their students how to type as well as help them type proficiently. It not only helps the students learn the keyboard but also helps them learn how to type the correct way and more efficiently.

When it comes to narrowing our choice of design we picked this design because it seems to be the most reasonable to make because it helps the students in memorizing the keys. We decided that we needed to drop one of our designs because it involved a lot of resources and work that we would most likely not be able to complete by the end of the semester. We went back and forth on what the trade-offs would be for the designs and this design is more efficient based on feedback we got and what best fits expert responses.

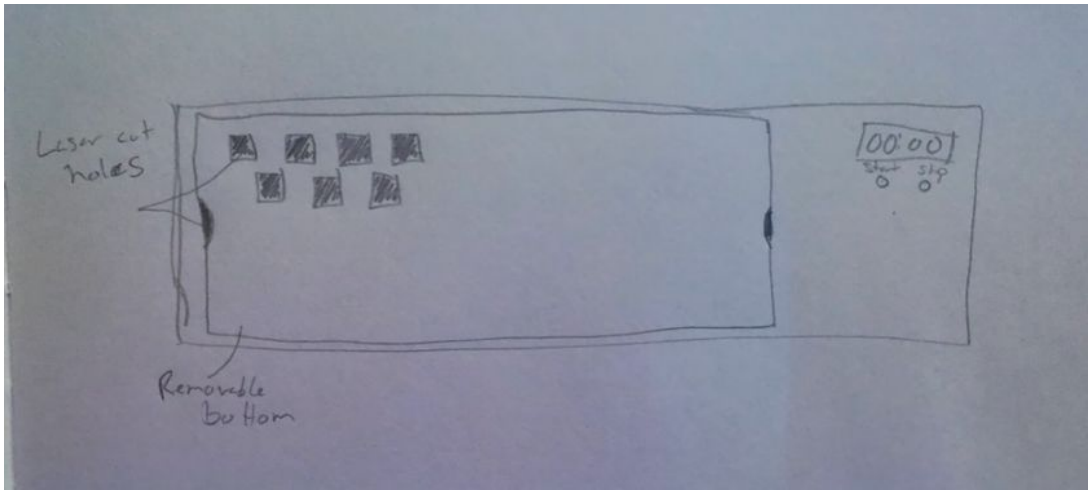
To expand, the design we picked is to make a full keyboard using the Laser cutter with the keys being separate pieces. The feedback is that we should stick to either Mac or PC. Also, our peers said our idea is attainable. We could add sounds to our keyboard to indicate if the user is right or wrong. The candidate enabling technologies would be the mentioned Arduino display screen would be good to use to make our keyboard more interactive and display time and the screen. Also Arduino nanosensor interface.

Based on feedback we contemplated the idea of using other keyboard layouts other than qwerty, such as Dvorak and other styles. We could use keys with pegs that are color-coded on the bottom of the peg with the use of a camera or we could make the whole bottom an NFC

sensor. We could use specific sensors that know what key it is supposed to be and the corresponding key either by shape or color or telegraphed, or laser a cut a rack with a camera underneath with the actual letter or have an inverse image of keyboard layout on them or colors.

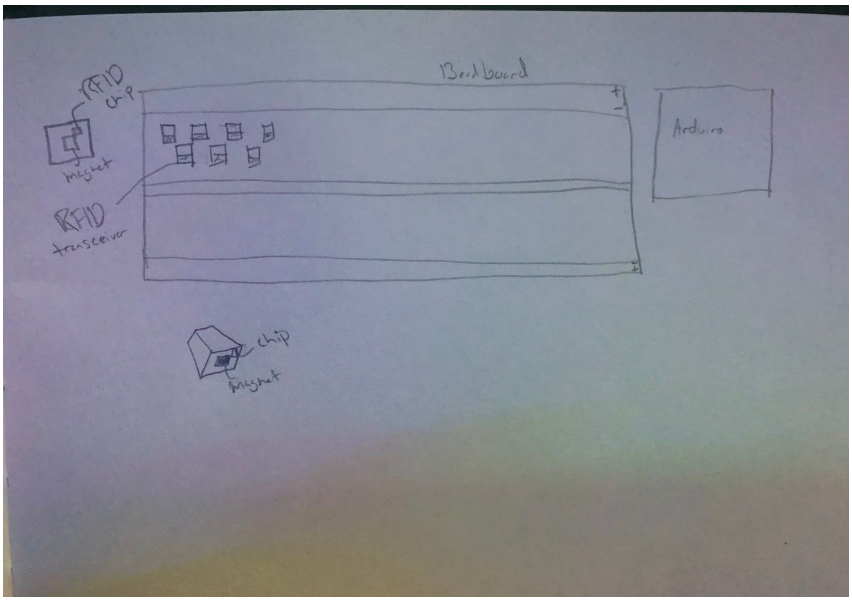


Other Views:



This sketch shows the timer to the right which will be used to test how fast the users can put the keys on the keyboard. There are also start and stop buttons next to the timer. The holes for the keys would be made through laser cuts and would be in a key-like shape. This picture shows that the bottom can be removed to be able to access all of the hardware under but keep the device neat and clean.

This other sketch shows the sensors we plan to use and the main keyboard area. The Arduino is to the right of the keyboard and the sensors are color sensors. The Arduino will be sitting under the timer section of our project which keeps it hidden. The color sensors will be on the beadboard and each key will have a color on the bottom of them.

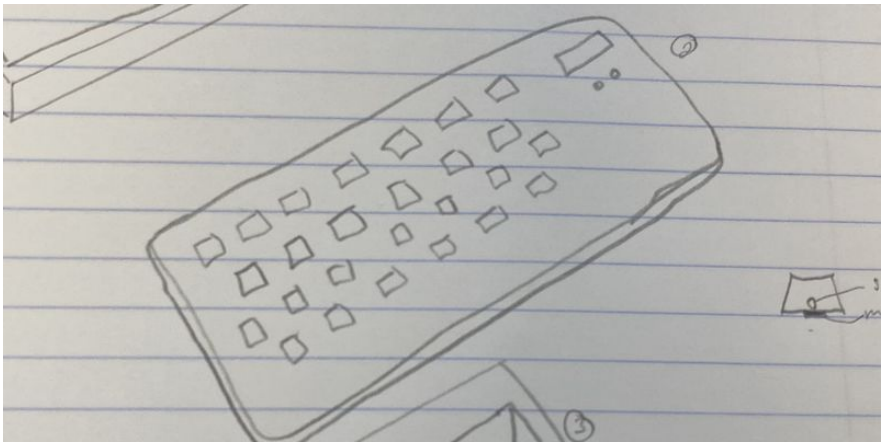


Design Alternative

Alternative 1:

Pros: It helps with the layout and memorization because the students will be able to easily identify where the keys would go based on the key shape.

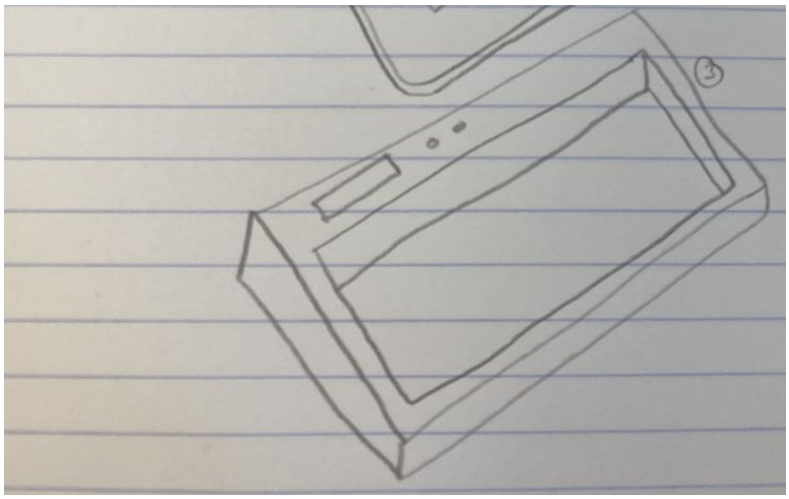
Cons: We wouldn't have enough space to house the Arduino.



Alternative 2:

Pros: We would have the start/stop and timer at the top of the keyboard in the user's plain view.

Cons: We can't make it an actual keyboard because we would have to run wiring on the bottom side of each of the key and there wouldn't be as much space to house the Arduino



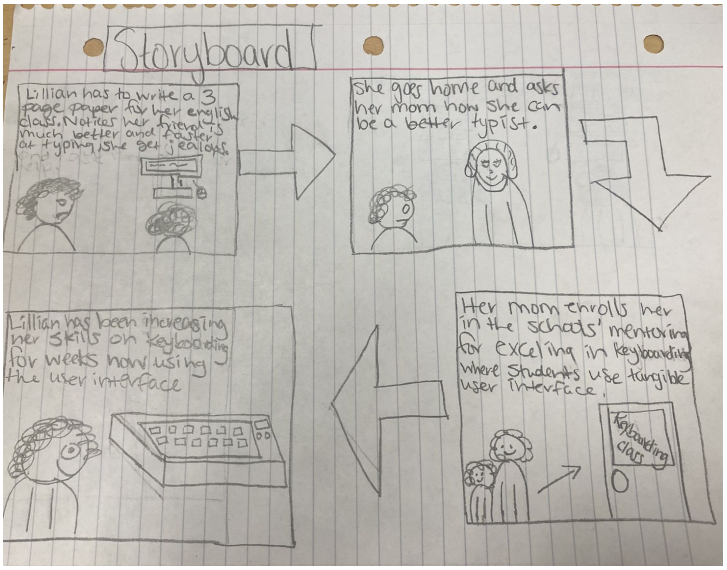
Personas, Storyboards, User Journeys

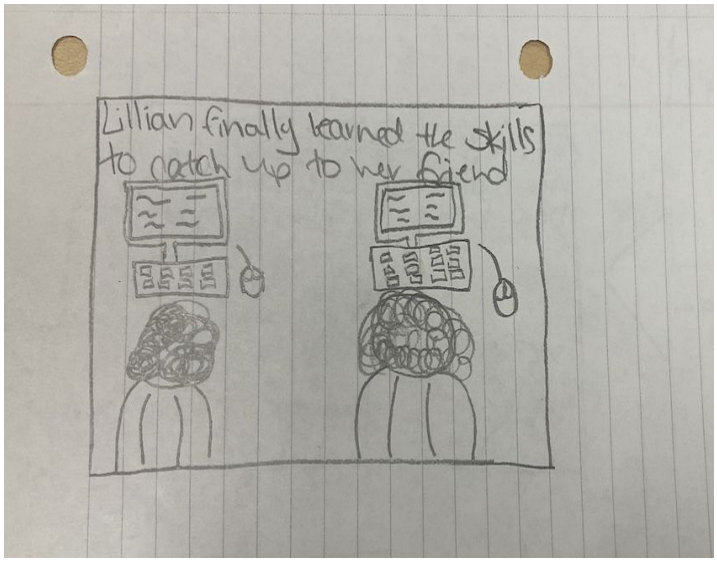
Our first persona is Lillian Graham, she is a 7th grader. We wanted to target kids in elementary and middle school who would be learning the keyboard layout and learning how to type at this time.

Fictional Name: Lillian Graham **Age:** 11 **Occupation:** 7th grader **Status:** Single **Location:** Charlotte, North Carolina **Tier:** Ameuter user **Archetype:** Adaptability, Cooperative **Goals:** Become an engineer, play competitive soccer **Frustrations:** School, Club Soccer **Bio:** Julia Rose is a student trying to become an engineer. She is currently struggling to learn how to type in a fast manner. She is behind other students and it takes her longer to finish assignments.	 https://www.gse.harvard.edu/sites/default/files//content-images/1500x750-girls-open.jpg

Our second person is Diana Smith. We think that teachers struggle with teaching their students how to type so the keyboard interface would be useful in aiding them to teach. It would help them guide their students in a more interactive manner to learn how to type faster and better.

Fictional Name: Diana Smith **Age:** 55 **Occupation:** Teacher **Status:** Married **Location:** Manhattan, New York **Tier:** Teacher **Archetype:** Caregiver **Goals:** Maintain a hobby of gardening, helps care for family **Frustrations:** Living in a noisy city, Evolving technology **Bio:** Diana Smith is a teacher and lives in New York. She is married to Bernard Smith who is a retired teacher. She loves reading and gardening. On weekends she goes to New Jersey to visit her family. Diana needs help with teaching her students how to type.	 https://i.pinimg.com/originals/5f/dc/d0/5fdcd0bf59aab51c3137f71c13e5473d.jpg



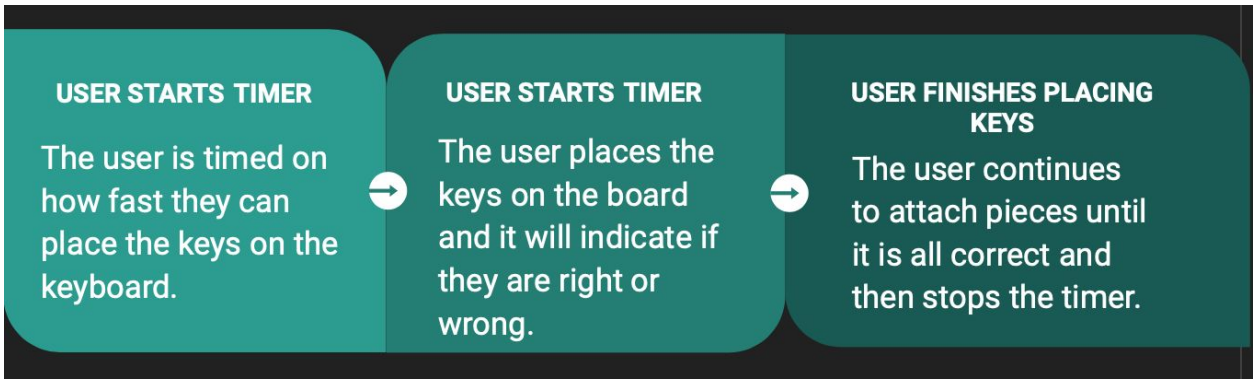


Interaction Model

All of the interactive pieces satisfy our design goals because the separate keys help the user actually interact with the keyboard. They can move the piece into the box-like object and even set a timer which helps them with memorization and efficiency.

When a user encounters technology, they start the timer. Then they fit all the keys into the right spot, based on the indication, the user will know if they put it in the correct spot or not. Then they stop the timer when the keyboard is filled and repeat this till they are efficient. Our system responds through the green or red sensors, letting the user know if they are right or wrong.

Action by User	Response of System
Design 1: User places key in correct location	Screen highlights that key in green
Design 1: User places key in incorrect location	Screen highlights that key in red
Design 2: User places finger in clamp and press the button with the finger that corresponds with that key	The clamp highlights green indicating that the user choice the correct key and that particular key is taken out of the shuffle of keys
Design 2: User places finger in clamp and press the button with the finger that doesn't correspond with the right key	The clamp highlights red indicating that user choice is incorrect and gets reshuffled back into the mix of keys
Design 3: User places two keys together that are touching on the correct side	The touching sides will turn green
Design 3: User places two keys together that are not supposed to be together	The touching sides will turn red
Design 3: User places two keys together but on the incorrect side	The touching sides will turn yellow



Tangible Prototype:

Our tangible prototype is made out of play-doh and popsicle sticks. We created the base keyboard layout from popsicle sticks and then added a paper layout of keys within the frame. Then we created individual keys out of play-doh which could be moved into the paper layout symbolizing our tangible interface. We thought this was the best idea because it allowed us to actually physically visualize how our design is going to work out and allow us to further think about how we will actually be able to implement this design. How this design works is that the smaller space on the right is where our timer and start/stop buttons are going to be located. The big open space is where the user is going to be placing the pieces and we will further decide to draw different keyspaces to indicate where the user will be placing the keys. The play-doh keys

that we decided to create are the shift, backspace, arrow, enter, space, and the whole alphabet keys.


SPACE
Shift
Shift
Backspace
Enter