



SmartBrush

Brighten your routine

CS 160 | USER INTERFACE DESIGN
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Many children brush incorrectly due to distraction while performing the tasks, not knowing proper technique, or being unaware of the potential consequences. Often times, children end up carrying these poor brushing and flossing habits into adulthood. Our app aims to teach young teens and young adults about maintaining proper dental hygiene habits through friendly competition using streaks. Users can follow the timed steps on the smartwatch to properly brush and floss their teeth. They can view their brushing habits and how well they do compared to their friends on their phone.

BRAINSTORMING PROCESS

Our team first brainstormed 50 ideas addressing a variety of healthcare issues. We narrowed down to 3 app ideas that we felt were distinct and not already available in the Play Store: Aunt Flow's In Town (a menstruation tracking app), Equipment Tracker (a hospital equipment tracking app), and My Shiny Teeth and Me (a dental hygiene timer and instructing app). After considering each of the three ideas' constraints, pros, and cons, we felt that My Shiny Teeth and Me had the most potential for interactions on mobile and the smartwatch.

The smartwatch gives the ability to view important dental information while performing the relevant task itself. The goal of our app is to educate youth on dental hygiene, and this education will at times

need to happen when a phone cannot be pulled out of one's pocket without inconvenience. For instance, imagine a child brushing his teeth in the morning. It would be inconvenient for them to constantly pull out their phone while brushing to view how/where/how much longer he should brush. A smartwatch on the other hand, gives easy instructions they could swipe through while brushing or performing another dental activity, as well as the ability to easily see notifications on when they are finished or when they should move onto another step. Finally, a smartwatch allows a user to easily indicate the completion of a task, such as brushing or flossing, without the inconvenience of having to pull out a mobile phone. This ability will prove useful in warning users and tracking their activity for generating statistics.

ORIGINAL IDEAS & SKETCHES

Our original app idea aimed to teach children (ages 6-11) about dental hygiene through a fun and interactive process on the smartwatch that outlines proper technique for the correct duration, whether it be brushing, flossing, or dealing with braces. We planned on utilizing timers, notifications, and analytics on the smartwatch and smartphone interfaces to teach children about dental hygiene. We wanted the watch to serve as a timer for users when they brush their teeth and the phone to serve as a home base for statistics and data analytics to help provide information for the children's parents.

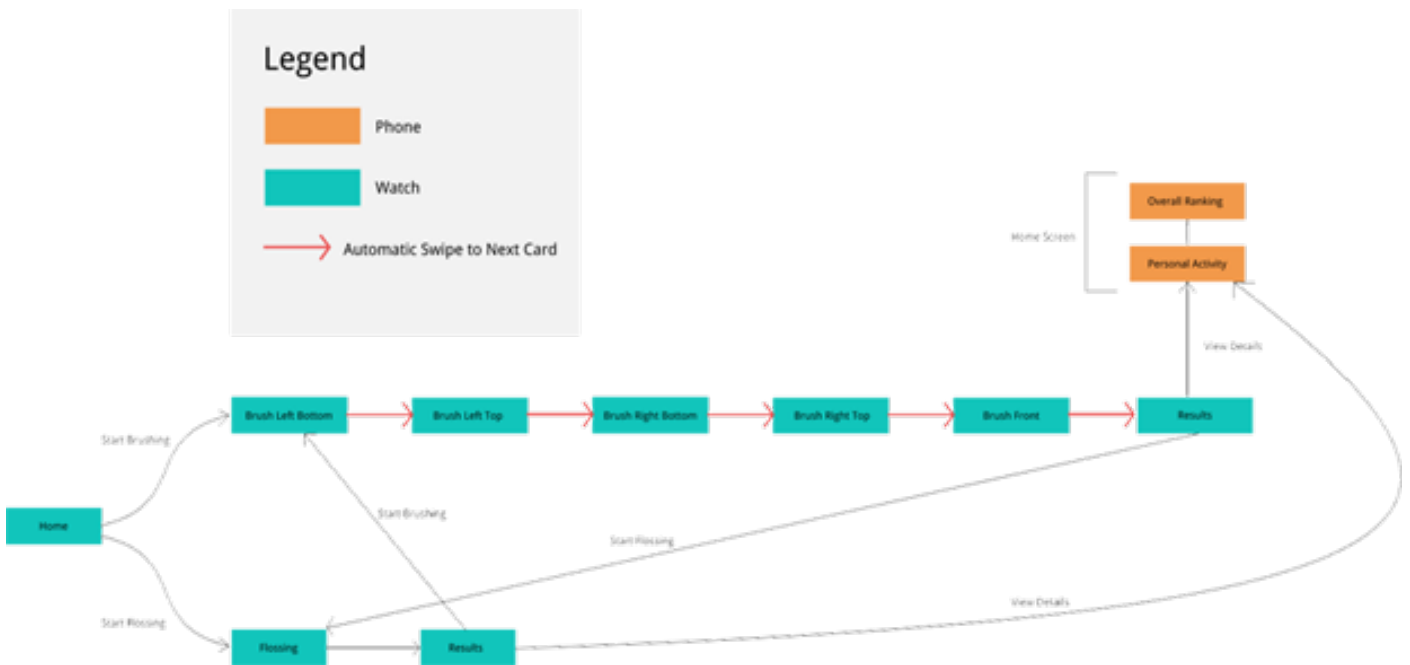
After some user research, we eventually decided to pivot from an audience of 6-11 year olds to 10-20 year olds, focusing more on adolescents and young adults who still needed to learn about proper dental hygiene tech-

niques. Our main impetus behind making the target audience was to differentiate our application from already existing applications in the Play Store that targeted children as their audience. We also changed our app name from My Shiny Teeth and Me to Smart-Brush to reflect our older target user. Despite this change in target audience, we still wanted to keep the division of tasks between the smartphone and smartwatch. Additionally, we felt that a nice way to motivate our target users would be friendly competition against their friends.

SKETCHES

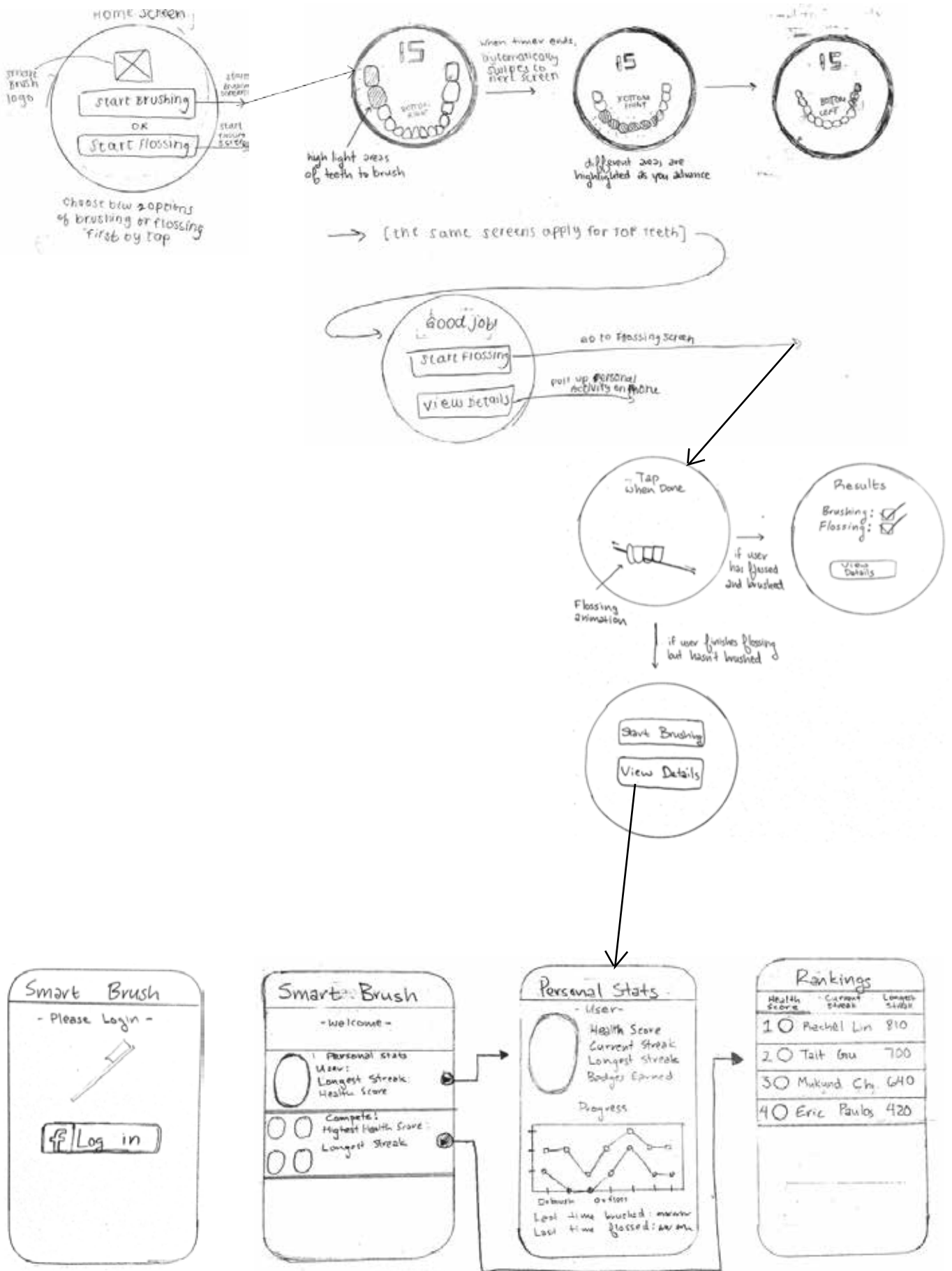


Our original sketch idea



User Journey Map

SKETCHES



CONTEXTUAL INQUIRIES

For our contextual inquiry, conducting a master-apprentice model was not plausible since it would have been invasive of our interviewee's privacy to watch them brush their teeth in their own homes. We reached out to a local pediatric dentistry, but we were unable to visit the office as we had to wait on receiving approval from the board to conduct interviews. As an alternative solution to understanding our target users' brushing habits, we sought target users who are part of communities that our team members are already involved with. We first asked to make sure they were available to meet either in person or over video chat. We had a set of questions written beforehand to ask each of our target users. The interviews were conducted over popular video chatting software such as Skype and FaceTime. For our interviews, we interviewed three people: a dental assistant, a mother of two boys, and a teenage student.

From our contextual inquiry, we found that there were certain themes and common tasks that arose in our discussions. One was that most people learned and developed their brushing techniques and habits from their parents. For instance, the dental assistant we interviewed noted that usually the child patients' (often times poor) brushing habits were mainly derived from the parents' similarly bad routines, and the mother we interviewed revealed that "most of what my kids learned about dental hygiene when they were younger comes from my own teachings and my husband's". Another common theme we found was that all the interviewees were aware of the consequences of poor dental hygiene, such as tooth decay and gum diseases. All the interviewees thus understood the importance of brushing, but admitted that they felt like the experience could be improved. This led us to our third common theme, which was that the interviewees felt

that it was important to encourage users to brush their teeth not just through understanding of the health risks, but through a fun and interactive experience. The dental assistant, for example, mentioned how she encourages children to maintain good oral hygiene by giving them with toys (e.g. handing toothbrushes with different brush designs), to keep them excited to come back. The final theme we found when interviewing users was that they felt that the teeth were extremely important aspect of one's physical appearance. They all felt that it was important to maintain good dental hygiene for the simple reason of looking good in front of peers and developing self confidence.

After the interviews for our contextual inquiry, we decided to synthesize the information we received to create a list of top 5 user needs. These would be the most important factors that we felt our app should address.

TOP 5 USER NEEDS

1. Have a fun and entertaining experience so brushing teeth won't feel like a hassle.

We want to use a fun and interactive avatar to guide through the brushing process, maintain a scoring/point system for competition amongst family members, play attractive music. Create a streamlined design to attract users of all age groups for usage on the phone.

2. Receiving feedback and tracking progress for techniques.

We will show feedback and progress for the amount of time spent for brushing certain areas of their teeth through a chart for each dental hygiene/teeth cleaning session. We will quantify their progress by tracking streaks (the consecutive number of times the user has brushed their teeth).

3. Learn proper brushing habits and techniques.

We would instruct which parts of their teeth to brush (top, bottom, back, etc.) as the timer is counting down, as well as what strokes to use (brushing vertically). After the brushing portion, it would follow up with flossing instructions.

4. Not slowing down the brushing/flossing process.

Let the interaction on the watch be simple and streamlined that doesn't add too much time on top of 2 minute timer. Because the interaction elements will mainly be restricted to the watch, any extraneous elements could detract from the instructions and purpose of our application.

5. Motivation to maintain good oral health and prevent dental disorders.

Because there isn't immediate feedback for poor dental care, users aren't always aware of what dental disorders they can get if they don't take proper care. They would be motivated to brush their teeth or floss if they knew about these potential cavities, disorders, and diseases as a result of not brushing or flossing. We want to provide facts if they neglect to floss and brush their teeth or if their progress is poor.

COMPETITIVE ANALYSIS

There are existing applications on the app store that deal with dental hygiene and taking users through the brushing process. They tended to be toothbrush timers with visual attributes in the application that instructed the user where to brush and for how long. The biggest issue we noticed when looking at these competitors was that they all focus on young kids around the ages 5-10. For instance, Chomper Chums turns the process into a game for children, by asking them to chase “sugar bugs” and providing rewards for proper brushing.

Quickbrush-Toothbrush Timer also provides a brushing timer but targets anyone above the age of 5. Aquafresh Brush Time USA has kids raising an animal by brushing well, and provides an original brushing song to keep users entertained while brushing their teeth.

When looking at these competitors, we noticed a clear need for an application that targets older children or young adults. From our user interviews, we found that many older children have developed bad dental hygiene habits growing up, that they need to break out of. SmartBrush differentiates from the competition by specifically catering to the needs of this user group. For instance, SmartBrush provides a more professional design that young adults would be comfortable using. The ultimate goal is to teach people aged 10-20 proper brushing

technique for the correct duration of time. Additionally, our application also intends to have instructions on other dental hygiene practices like flossing, allowing for a more well rounded approach to dental health.

In addition to being the only dental hygiene application specifically for 10-20 year olds, SmartBrush has 3 key differentiations. First, it is the only application to make use of social media and competition as a means of motivation from brushing. Friendly competition with Facebook friends directly appeals to the teenage user group. Second, we utilize the unique aspects of the smartwatch to provide the best brushing experience for users while they also interact with our application. The hands free method of easily glancing at a watch while brushing, compared to holding out a phone, really separates us from existing solutions. To make brushing with our app a seamless experience, we also provide automatic transitions between screens and an easy to see visual progress timer. Finally, SmartBrush incorporates flossing, which is an essential part of dental hygiene. A user can only build a streak by brushing twice and flossing once in a day. In summary, SmartBrush stands out from the competition as the only brushing app for young adults, running on the smartwatch, utilizing social media, and featuring clear animations of brushing and flossing.

WIREFRAMES

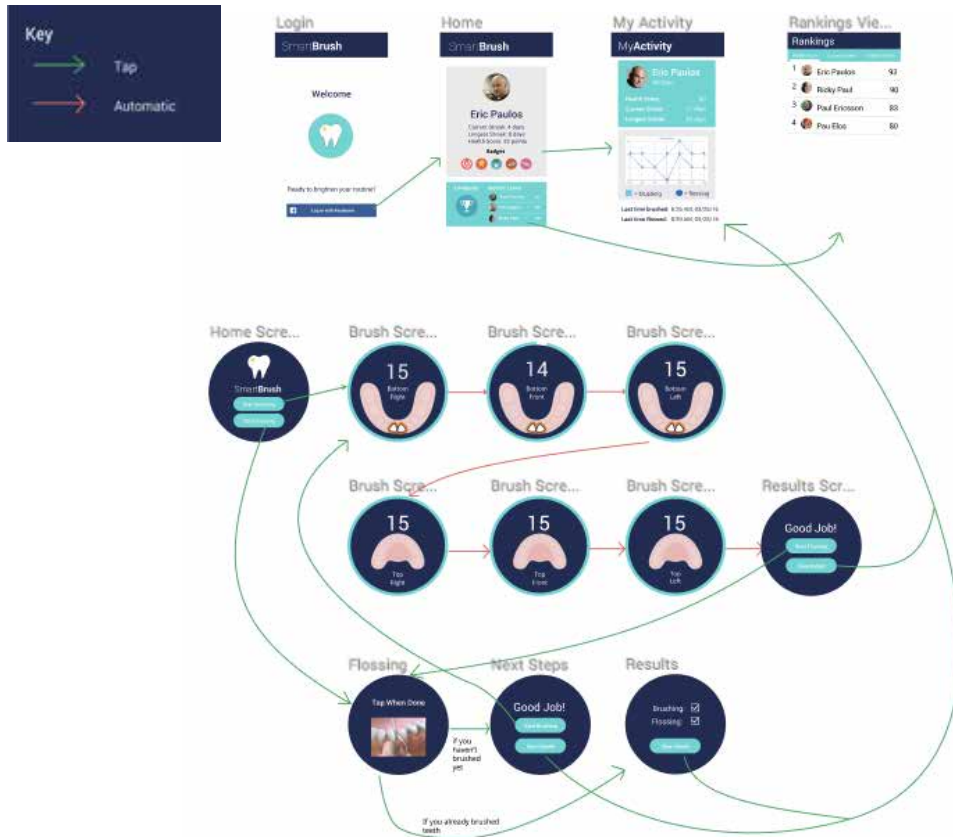
made with **figma**

For this project, we used Figma to create wireframes that gave an overview of our app's flow and transitions from screen to screen. When we shifted our target user group to an older audience, we decided to create a design that looked more professional to appeal to a wider audience. In our first design iteration, we chose our primary color to be a dark blue and played around with secondary colors to find the most appealing palette. We also decided to

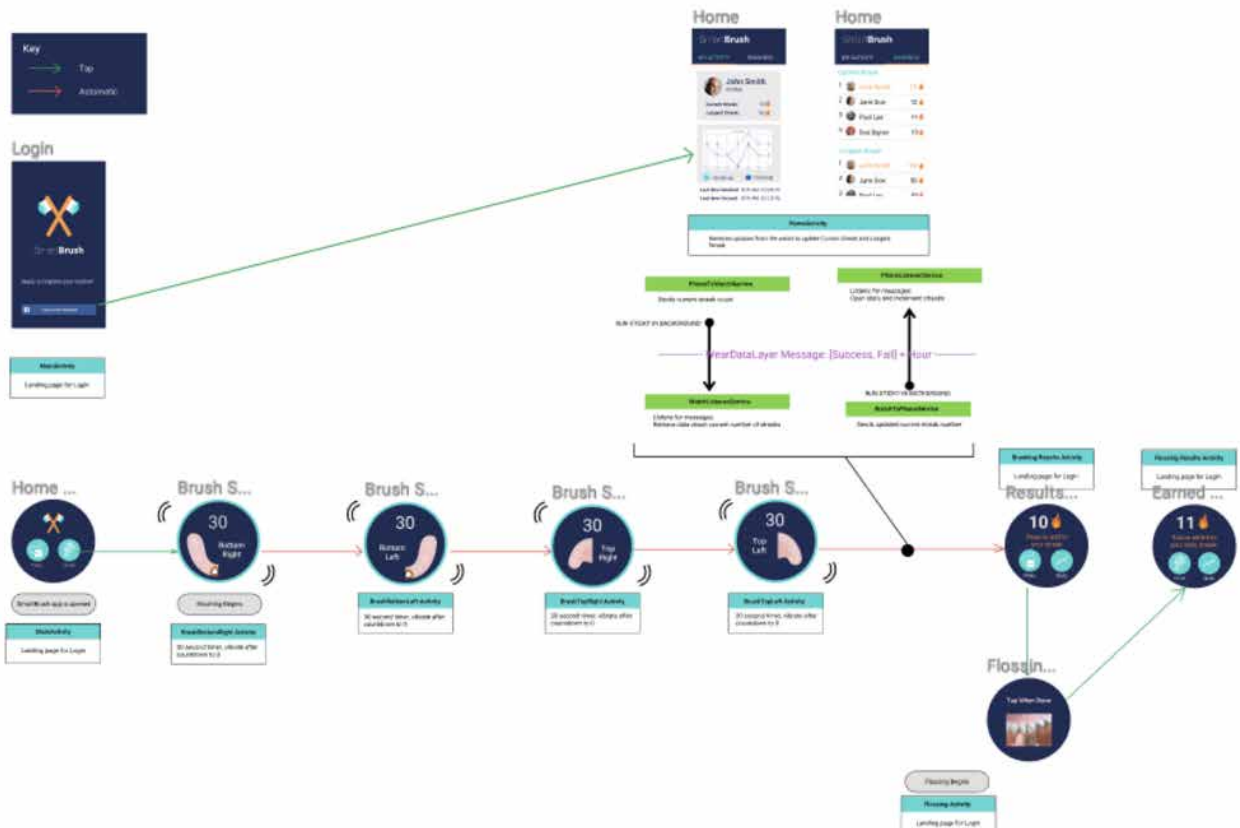
include a home screen which would then access the My Activity and Rankings screen.

Eventually, after some user tests and feedback from other students and TAs in the class, we decided to change and refine aspects our design. We removed the home screen as we found it to be redundant, and we changed the buttons from ovals to circles to solve the fat-finger problem on watches.

Version 1.0

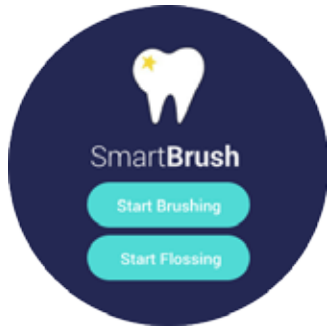


Version 2.0



BRUSHING YOUR TEETH

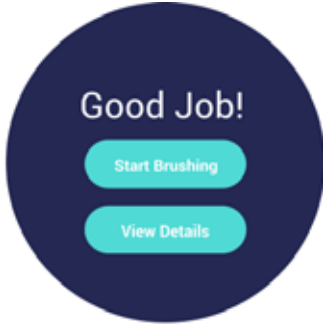
v 1.0



Begin by brushing or flossing



Each brushing screen counts down from 15 seconds for 6 regions



Show encouraging message for completing task

BRUSHING YOUR TEETH

v 2.0



We updated the logo, removed text, and created circular buttons



Each brushing screen counts down from 30 seconds for 4 regions



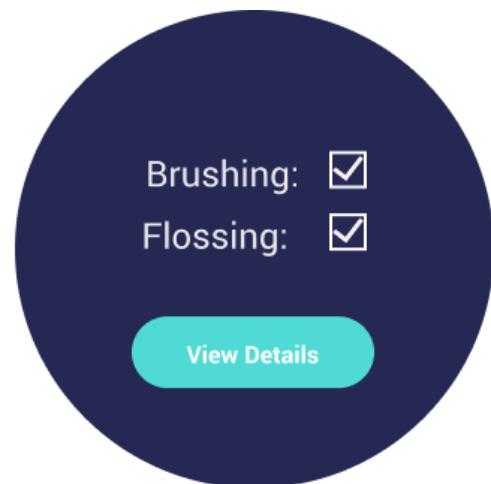
Show current streak count and message indicating next steps to make progress

FLOSSING YOUR TEETH

v 1.0



Flossing animation will play

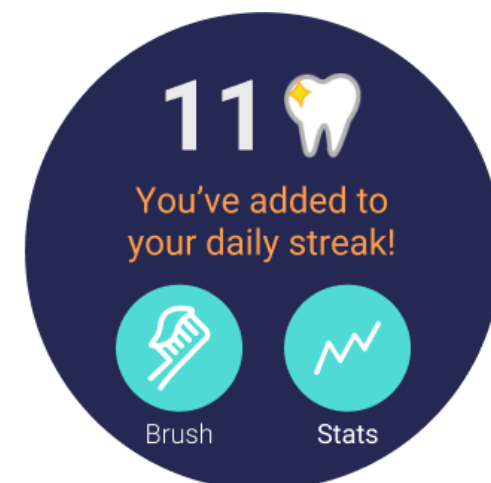


Screen shows what tasks you have completed

v 2.0



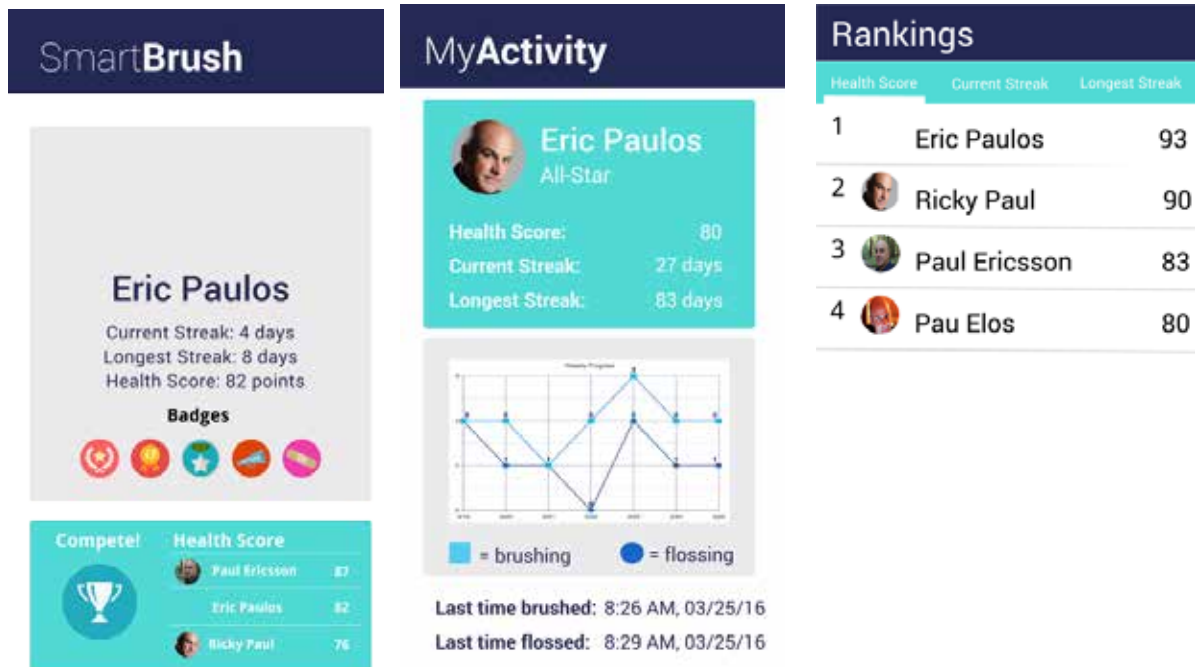
Flossing animation will play. Tap to proceed.



Shows updated streak count.

VIEW ACTIVITY & RANKINGS

v 1.0

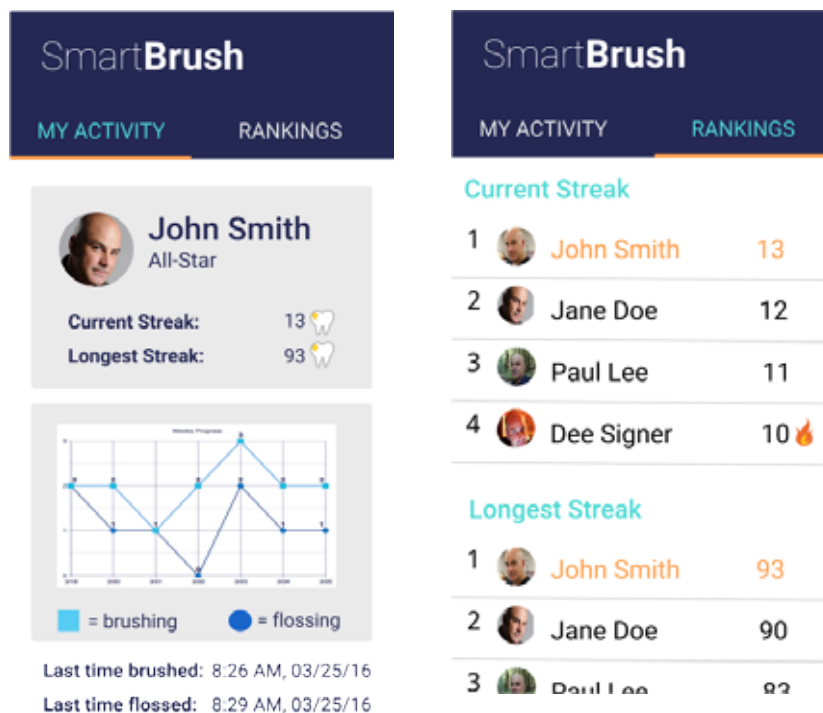


Home screen shows summary of points and pages and rankings.

Shows user's weekly progress, overall health score, current streak, and longest streaks.

Rankings Screen displays the list of the different ranking categories: Overall Score, Current Streak, and Longest Streak.

v 2.0



Toggle between My Activity and Rankings

Displays two lists: Current Streak and Longest Streak, which updates in real time.

USER STUDIES

For our user studies, we showed the first version of our wireframes to users in order to validate the design concept. Our first user participant was a dental assistant who mainly validated whether we were correctly instructing the users about brushing and flossing. After walking through the 6 different brushing screens of the different regions on the watch, she recommended that there should be 4 regions of teeth for 30 seconds each instead of 15 seconds for 6 regions. The standard for instructing teeth brushing includes brushing these four different regions: Top Right, Top Left, Bottom Right, and Bottom Left. She appreciated the flossing screen as well, because it is an essential part of the dental hygiene routine that is often overlooked and necessary for preventing gum diseases. She wasn't entirely clear of what the overall health score meant. We used this feedback to improve our brushing screens and clarify the statistics we track by establishing the concept of brushing streaks.

After speaking to a dental assistant, we gathered feedback from 2 potential users of our application. The feedback from these two users led to changes in the UI such as adding animated gifs to make the brushing screen instructions more clear and appealing to view. They also validated our idea that our rankings and streaks would motivate our target user group to maintain good dental hygiene. Finally the user feedback helped us realize which user interactions were unclear (such as the meaning of a view details button), and make these interactions less ambiguous in the final design.

PARTICIPANT #1

16 year old high school sophomore from San Jose, CA attending Presentation High School and the youngest child of a middle class family of 6.

She was able to easily follow the user flow of the application, both on the phone and the watch. However, after finishing brushing or flossing on the watch, she was confused by the functionality of the view details button (which we intended to bring up her statistics on the phone). On the My Activity screen showing statistics, she was impressed by the charts on her brushing history and excited by the tracking of brushing streaks. But, she was confused by “health score,” specifically how she could improve it and what the max possible score was. Furthermore, she complimented the design on the rankings screen of swiping between tabs to change ranking views, but wondered who the other scores she could see would be (i.e. random people, all her facebook friends, etc.). On the watch, she found the use of a ring that disappears as a timer to be cool, and liked the automatic switching between screens when time expired. However, she expressed some confusion in relat-

ing the text such as “Bottom right” to the image of teeth, particularly in the first brush screen with two teeth in different colors. For flossing, she expressed some confusion at why the floss screen on the watch did not have a timer like the brushing screens she previously saw. She was expecting to be given a minimum time to floss. Finally, she thought the results page after flossing, specifically the checkmarks, was useless since she already knew that she brushed and flossed.

PARTICIPANT #2

14 year old high school freshman from San Diego, CA who plays tennis and lives in an upper middle class neighborhood

The user is a high school student from an upper middle class neighborhood. When simulating the brushing and flossing on the watch, he immediately noted that he hates looking at his phone in the morning because it's too bright, but the blue on the watch was "easy to look at." When simulating brushing his teeth, he stared at the watch the entire time, waiting for 15 seconds to countdown before moving his toothbrush to a different location in his mouth. The development team had discussed having music play during this portion to make it less boring, but this user had no qualms with the silence. The user liked that he could view details on his brushing habits immediately after brushing. He like the simplicity of the icons and the color scheme, but thought the font sizes should be changed in the user details screen to bring emphasis to the stats. The user also understood the functionality of the screens and which parts of the screens could be manipulated to display different in-

formation, such as swiping left to right on the "Rankings" screen to show different leaderboards. Overall, the user thought the app was easy to use and helpful with few aesthetic choices that were detrimental to the functionality.

The feedback from these two users led to changes in the UI such as adding animated gifs to make the brushing screen instructions more clear and appealing to view. They also validated our idea that our rankings and streaks would motivate our target user group to maintain good dental hygiene. Finally the user feedback helped us realize which user interactions were unclear (such as the meaning of a view details button), and make these interactions less ambiguous in the final design.

FINAL DESIGN

made with



BRUSHING YOUR TEETH



Begin by brushing or flossing



When the countdown reaches zero, the watch vibrates

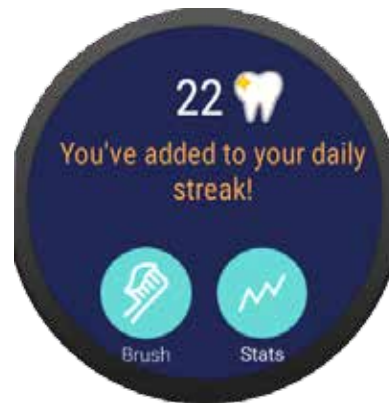


Choose between moving on to the flossing task or view stats on phone

FLOSSING YOUR TEETH

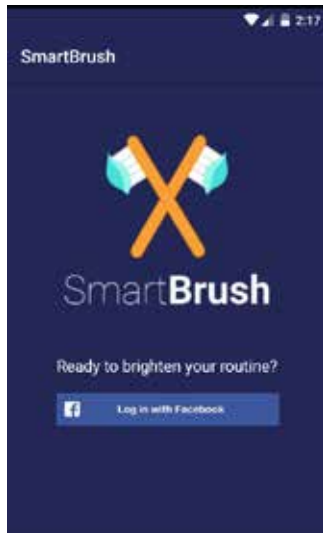


Flossing gif animation will begin playing. Tap to indicate when you're finished.



Streak has updated after completing two brushes and a floss in a day

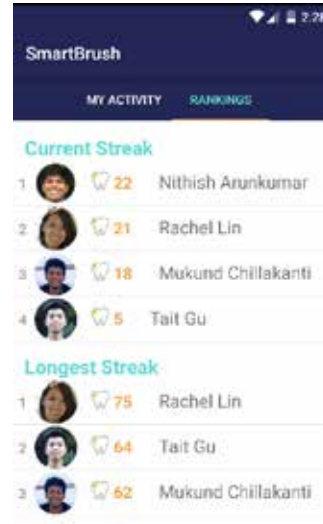
VIEW ACTIVITY & RANKINGS



Login with your Facebook account so you can start competing with friends.



Shows personal weekly progress with the last time you brushed your teeth and the last time flossing your teeth.



Displays two lists: Current Streak and Longest Streak, which updates in real time.

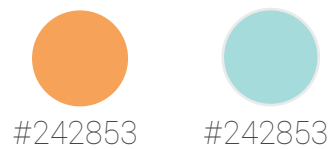
BRANDING

COLORS

PRIMARY



SECONDARY



LOGO



for dark backgrounds



for light backgrounds

TECHNICAL CHALLENGES

In implementing our application, we faced some interesting technical challenges, particular on the smartwatch. The smartwatch implementation consists of automatic transitions between 4 brushing screens with animated gifs, a flossing screen, and a results screen that displays a user's streak and gives the user the ability to open up statistics on the phone. The most involved technical challenges were displaying animated gifs of brushing and flossing and storing / displaying a user's streak results after brushing.

To display a user's streak after they brush or floss, we needed to keep track of "streaks" on both the phone and the watch. A streak consists of brushing twice a day and flossing once a day. The challenge in keeping track of streaks was to reset information at the start of a new day (by keeping track of timestamps in Java since a user can only add to their streak once a day), and being able to display the updated streak on the watch. Since we store streak data on a user's phone, pulling up the latest streak on a user's watch is not a straightforward process.

The user flow is the following:

- When opening brushing/flossing results on the watch, a WatchToPhoneService sends a message to a PhoneListenerService
- The PhoneListenerService updates streak information on the phone storage and calls a PhonetoWatchService. To keep track of both longest and current streak, we store the longest streak, the current streak, daily brush count, daily floss count, a boolean indicating whether a streak has

already been incremented for the current day) last time updated, last brush time, and last floss time on a user's phone.

- The PhonetoWatchService sends the streak information to a WatchListenerService
- The WatchListenerService opens up the watch results screen with the latest data.

This 4 step process allows us to display data to the users on the watch.

Furthermore, we figured out how to display animated Gifs on a watch. This involves creating a static graphic in Illustrator. Then, we added motions to the graphic in After Effects and exported the file as a Gif in Photoshop. Using the movie class in Java, we create a GifView that shows the corresponding section of teeth changing from yellow to white as time counts down for each brushing screen. On the emulator, the flossing animation worked normally, but on the watch itself, the flossing animation couldn't play because of memory issues.

On the mobile side, the user home activity page just pulls in user data from SharedPreferences in Android and updates streak and latest time brushed/flossed information. We learned how to implement swipeable tabs and fragments to provide a convenient interface for users to switch between the rankings and home activity streaks. The rankings view implements a custom list adapter, customized to include a photo, name, and streak information. The ordering of rankings changes based on the order of the streaks.



Our mission with SmartBrush is to teach adolescents and young adults proper dental techniques for brushing and flossing while also motivating them to maintain these good dental habits through friendly competition against other users. Although many people brush their teeth, they often do so with poor techniques passed down to them from their parents when they were children. These mistakes include missing certain areas while brushing, brushing horizontally instead of vertically, or brushing for the too short of a duration of time. We aim for our application to correct these mistakes, and encourage users to adopt proper techniques to help protect them from future dental issues down the line.

One of the main features in SmartBrush that helps achieve this is the smartwatch brushing timer. We designed this timer to count-down the dentist recommended two minutes of brushing by splitting up the teeth into four sections

(top left, top right, bottom left, bottom right) and allotting 30 seconds of brushing for each separate section. We designed the timer to be very straightforward to use with a minimal and clean aesthetic. When the user starts the brushing timer, the watch counts down through each of the four section for 30 seconds each with a visible number countdown and a progress ring that loops around the watch screen. Animations on screen highlight the area of the teeth to brush, and slowly fade from yellow to white to represent the cleaning of the teeth. If the user chooses not to look at their screen while brushing, we also included a vibration at the end of each section, so the user will know to move on to the next section of their teeth without having to look at the watch. Similarly to brushing, we included a flossing screen on the watch as well, which plays a simple animation showing users how to floss and waits for users to tap on the screen when done.

To motivate our target users to maintain their dental hygiene, we adopted the idea of having a streak and using social competition through ranking users amongst their friends. A streak is incremented by brushing twice a day and flossing once a day, and users are able to see both their current streak and their longest streak ever on their personal profile page. When looking at the rankings, users will be able to see how they rank amongst friends that are also using the app. Because streaks take time to build up and are relatively easy to keep, users will be motivated to maintain their dental hygiene through brushing and flossing each day, as they wouldn't want to lose their rankings amongst their friends. We felt like this technique would be especially effective amongst our target audience, as 10-20 year olds are often engaging in social media and aim to keep up appearances amongst their peers.

Hopefully, through these main features, SmartBrush will be able to encourage users to de-

velop good dental hygiene habits and teach them how to properly brush their teeth and floss. We aim for our application to be a simple and effective solution to a health problem that is commonplace in society today, while also creating a fun experience for users as well. Through SmartBrush, users will be able to prevent future dental issues and have an enjoyable experience amongst friends, ultimately brightening their routine.



<https://github.com/cs160-sp16/Group-37-Project>