

I. Abstract:

Viruses can make people very sick and keep us home from school. You can spread viruses to your friends and family before you know you're even sick! Our toothbrush will test your saliva every time you brush for viruses like COVID. Our toothbrush can also check for cavities, and our 3D printer can print braces. It can talk to your doctors and dentists about your health. Our toothbrush of the future has a computer and an AI program to make decisions about what its sensors see. The toothbrush also includes speakers, a camera, and 3D printer. Just brush your teeth and put your toothbrush into our machine! You will get results in seconds.

II. Description;

1. Present Technology

Different types of toothbrushes exist today. The first type is a manual toothbrush. The manual toothbrush is one that you can move yourself. You use your arm and hands to move it up and down over your teeth. The electric toothbrush is a toothbrush that makes fast automatic motions either clockwise or counterclockwise. A chewable toothbrush is a small plastic stick with no toothpaste. You bite it and then you chew it like gum then you spit it out like gum.

Today's toothbrushes can not talk to you. They can not tell you if you have a cavity or not. The toothbrush can not send a message to your dentist. It can not detect Covid-19/virus. It can not squeeze toothpaste on your toothbrush. It can not straighten your teeth. You need to use your hands to brush.



Picture 1: Toothbrushes

2. History:

History is important because you don't want to invent something that is already invented.

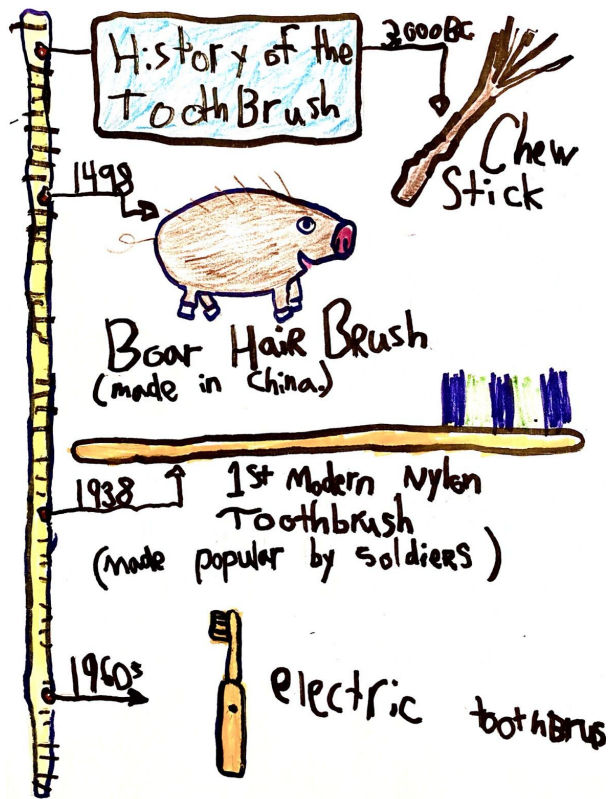
History of the toothbrush shows how it changed over time for the better.

3000 bc - Chew stick. The chew stick has a frayed end

1498 - Boar hair brush made in China

1938 - 1st modern nylon toothbrush. Made popular by soldiers

1960s - Electric toothbrush brushes



Picture 2: History of toothbrushes

3. Future Technology:

Our toothbrush will brush your teeth and do so much more. We made a list of what our toothbrush will do in the future. It will detect viruses like Covid 19 and other diseases, tell if you have cavities, or gum disease, color change based on the information such as cavities, temperature, heart rate, oxygen level. It will be able to communicate with your doctor and dentist. Our toothbrush will also straighten your teeth using a 3D printer to print braces if you need them.

Our toothbrush will need lots of different things to work like a computer, sensors, 3D printer, communication to the internet, computer programs. Computers have hardware and software. They can solve problems faster than humans. They help us do work. Our toothbrush needs to get information from us, then study it, then tell us what it sees. To get information from us, our toothbrush will need sensors and cameras. This information is given to our toothbrush's computer central processing unit (CPU). It's like a brain. It sends signals to control the other parts of the computer, and makes decisions. Just like our brain tells our body what to do like walk and talk.

Coding is how the computer knows what to do. They are the instructions put together to make a program. There are lots of different languages for the computer, but all of them are written by people. Computers are only as smart as the person who is telling it what to do. The things that a person tells the computer have to be very specific. Our computer will use an

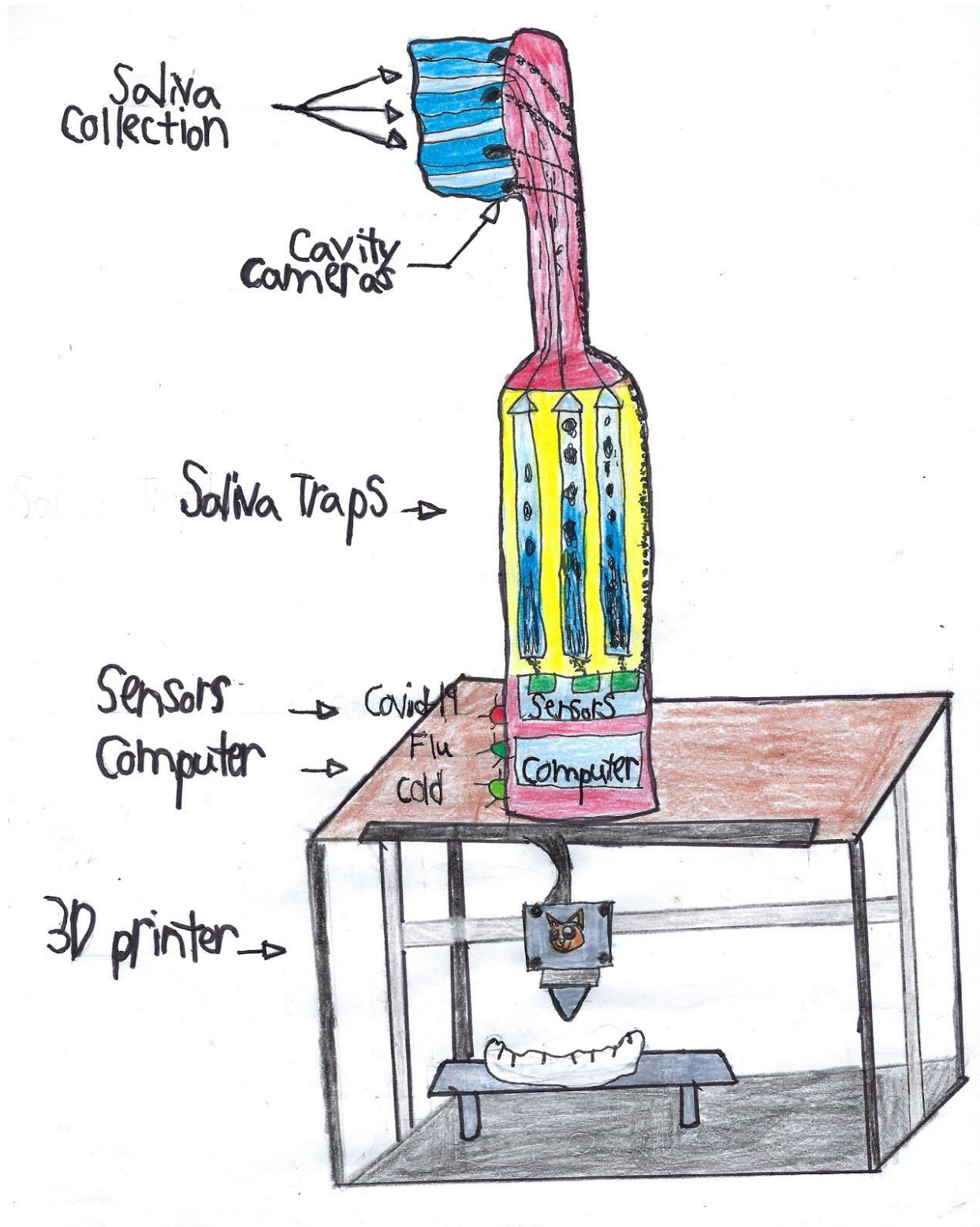
Toothbrush of the Future

artificial intelligence program in our toothbrush so it can learn just like us humans. It needs to learn what cavities look like and what bacteria is good and bad.

Sensors are computer parts that measure things like quantity or color or what materials are there. There are many different kinds of sensors like motion sensors or thermal sensors. My doorbell ring is a motion sensor because it rings when someone moves outside. For our toothbrush of the future, the computer and sensors would need to know when to start looking at saliva, what it's looking for in the saliva, and what it should tell us after it looks at our saliva.

The cameras on the toothbrush will take images of teeth when you brush. The computer will send information to the 3D printer and to the dentist. The 3D printer will mold and shape the retainer/braces. The 3D Printer needs lots of pictures of your teeth from all sides. The pictures come from the toothbrush cameras. The toothbrush gets the pictures when you brush your teeth. It gets pictures of every single side of your teeth. The computer program uses the pictures to make a blueprint. The 3D printer uses the blueprints to make braces. It prints braces that fit on your teeth layer by layer until it's done.

Toothbrush of the Future

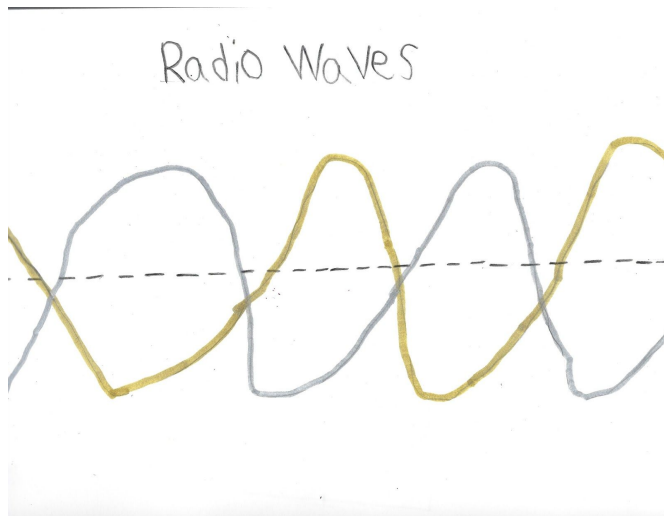


Picture 3: Parts of our toothbrush

Toothbrush of the Future

We want our toothbrush to be able to communicate so it can send messages to your dentist & doctor. They will know what to do if you have cavities or a virus. They can review the picture and information. They can see if you need them to pull out a tooth to put braces inside. It will also have a speaker to talk to you and light up if you are sick with the flu, cold or Covid.

The computers from all over the world are connected together. This lets us talk and share information. There are wireless and wired connections. A lot of houses have wireless connection from their computers to the internet. Our toothbrush will connect to the internet through wireless connection to tell our dentists and doctors our teeth and our health. The information travels on radio waves. Radio waves travel at the speed of light and are invisible. Radio waves are used for many things like cell phones, TV's, radios, satellites and computers to communicate.



Picture 4: Radio Waves

3. **Breakthroughs:**

Our Toothbrush of the future will need breakthroughs to make the toothbrush work today.

We will test the breakthroughs.

Breakthroughs in 3D printing

They need to be smaller than modern times. You could hold up a picture and it would print it out for you. We can experiment by showing a picture of your teeth for it to print out braces for your teeth.

Breakthroughs in Sensors

They need to know how to detect many different germs at the same time. We tested a battery so we will try to make a replica but different. We are thinking that the battery is the germ and the battery tester is the sensor. You would then put in the germ aka battery on the sensors and the sensors need to tell you the type of germ. Another test we could do would have groups of people of 100,000. One group could have covid or other germs and the other group could have nothing and we can test if the sensors are working.

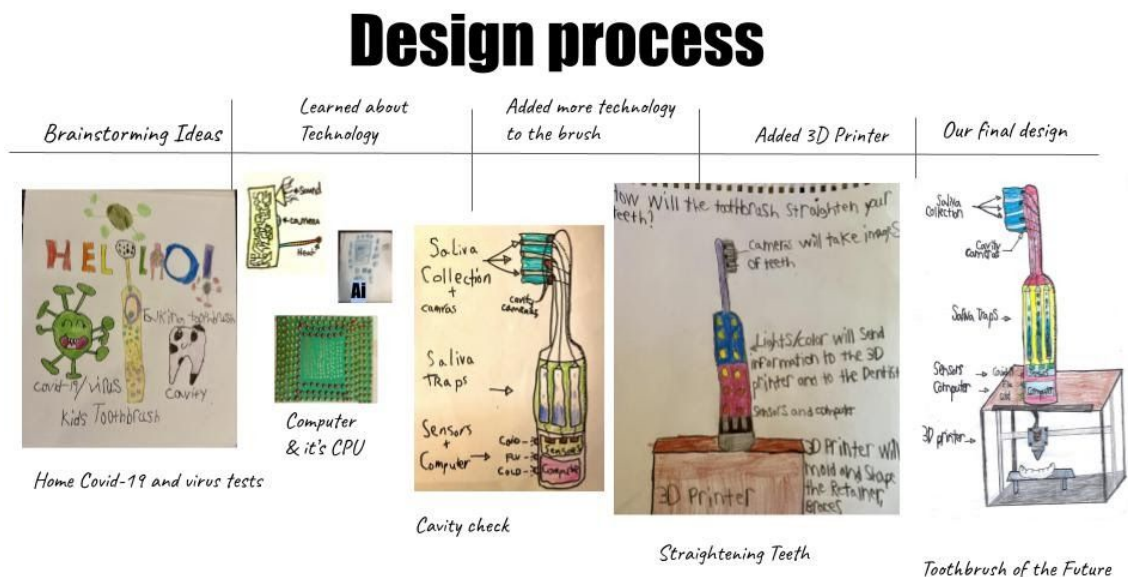
Breakthroughs in Ai

Ai needs to be dependable because it's very important. Ai is a new technology and not always correct. Ai software testing would need to be performed. We have to program our voice and mouth germs for the toothbrush to recognize it.

Toothbrush of the Future

4. Design Process

Our first thought was to make an easy test for covid that people could use at home everyday, because we wanted to play and keep people safe. One of our teammates also did not like getting a long skinny Q-tip put up their nose for a covid test. We wanted to design a future toothbrush that will help us go back to school. We learned about sensors and added sensors so it can detect other viruses and germs. We needed a computer to analyze viruses and store them. Our teammate had many visits to the Orthodontist and many x-rays, and surgeries. We wanted our toothbrush to straighten your teeth too. We learned about 3D printing to mold a retainer for braces. So we also added a 3D printer to our design that the toothbrush sits on. We also added communications to send messages to your dentist and doctors so that they know if people have cavities or a virus.



Picture 5: Design Process

5. Consequences.

Our toothbrush will have positive consequences. The toothbrush will help your health by telling you what viruses you have and if you have cavities. Our toothbrush has lots of technology. We can straighten teeth. If people have straight teeth they might be happier and smile more. The best part of our toothbrush we will be able to go back to school and play with our friends.

Negative is bad and the opposite of positive, these are negative consequences for our toothbrush. They use lots of plastic which is bad for the environment. The toothbrush is going to cost a lot of money. Lots of people may want to steal the information about yourself in your body.

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Picture 1: Image:

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Picture 2: History of toothbrushes made by team

Picture 3: The parts of our toothbrush made by team

Picture 4: Final design made by team

Picture 5: Radio Waves made by team

Picture 6: design timeline made by team

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Web Pictures

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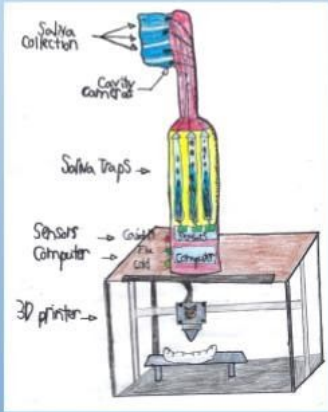
IV. Sample Web Pages:

Web Page 1: Home Page

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Toothbrush of the Future

Not only will our toothbrush brush your teeth but it will also sense if you have any bad viruses, check for cavities, and 3D print braces.



Our team explaining our Toothbrush of the Future

When the word Sources on the menu is clicked, you can see links that tell you where we got our knowledge from.

When you click on  then you will see our video.

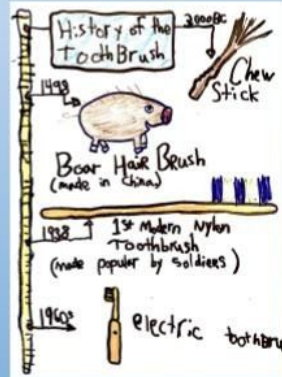
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Present Technology



Click on each toothbrush to learn more about the toothbrushes we use today.

History



Click on the history to learn more about each toothbrush.

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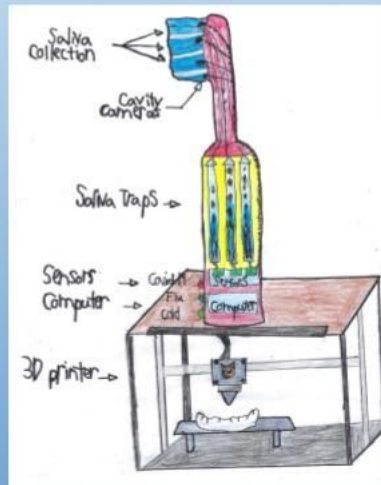
Future Technology Toothbrush

The camera will take pictures of your teeth and see if you have cavities.

Our toothbrush will use sensors to detect if you have the viruses or any other bad things in your mouth.

Our toothbrush uses a computer and Ai & CAD programs to analyze what diseases you have, if you have cavities, and if you need braces. It will also send information to dentists and doctors.

The 3D printer will print braces if needed.



Click on the toothbrush bristles to learn and see the bristles take an image of your teeth.

Click the saliva traps to learn and see your saliva being tested.

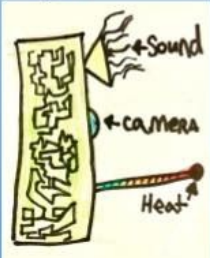
Click on the 3D printer to learn and see how our tooth can print braces.

Breakthroughs

Our Toothbrush of the future will need breakthroughs to make the toothbrush work today. We will test the breakthroughs.

Breakthroughs in Sensors

The sensors need to know how to detect many different germs at the same time. We tested a battery so we will try to make a replica but different. We are thinking that the battery is the germ and the battery tester is the sensor. You would then put in the germ aka battery on the sensors and the sensors need to tell you the type of germ.



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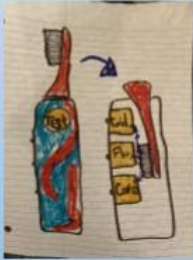


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Design Process




Brainstorming



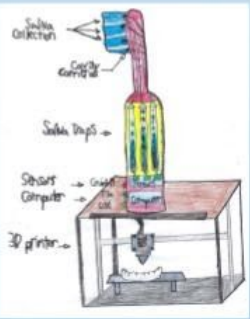
Design to test for viruses



Added technology



Added a 3D Printer



Our final Design

Our first thought was to make an easy test for covid that people could use at home everyday, because we wanted to play and keep people safe. One of our teammates also did not like getting a long skinny Q-tip put up their nose for a covid test. We wanted to design a future toothbrush that will help us go back to school. We learned about sensors and added sensors so it can detect other viruses and germs. We needed a computer to analyze viruses and store them. Our teammate had many visits to the Orthodontist and many x-rays, and surgeries. We wanted our toothbrush to straighten your teeth too. We learned about 3D printing to mold a retainer for braces. So we also added a 3D printer to our design that the toothbrush sits on. We also added communications to send messages to your dentist and doctors so that they know if people have cavities or a virus.