After finalizing that we wanted to create a temperature display sensor, we had to gather all the parts we need to create our project. Two main parts were needed to complete the project the temperature sensor and the NeoPixel Ring with the Arduino. So we started by finding the main components for each part we needed first. So we started with finding Xbees radios, temperature sensor, an Arduino, and NeoPixel Ring. After finding the main components, we then had to ask ourselves a series of questions that came up. What components we need to find or order that were not our main components? What will we be using to power this device? What components need to be soldered together so we can use them properly? What will the setup be in order to make everything stick together? So it came time to answer these questions because we had to have this figured out before we could code and test the device.

There was a couple of remaining pieces of equipment we need. We need a series of colored wires to transfer power and data to the different components. We need the foundation for our project so we went with two breadboards, one that we could solder on. Also the power components which were the rechargeable battery, solar panel, and the solar lithium polymer charger. We also needed two male connectors so we can plug the rechargeable battery and temperature sensor to the solar lithium polymer charger. With some pieces of equipment like Xbees we had issues that some we were not able to be write on them or some would just not want to communicate with each other no matter what settings we changed on the devices. It was a hard to find a pair of Xbees that worked with each other. This is one of the reasons we had to down scale the amount of Xbees we wanted to use in our project. Once we had all of these pieces it was time to work on putting them together to get the project rolling.

We decided in order to power the device we needed to find a source that was small and self-sustaining because the temperature sensor was going to be outside. So the idea of connecting it to direct power source was out of the question because it is hard to find a power outlet outside your house. We also wanted something that would be able to hold charge for a decent amount of time. First we just thought about a battery connecter to the sensor to supply it power but the issue came up that the battery would die out very quickly so we had to come up with something else to add to this concept. We then thought since the device is going to be outside so we could power it using solar panels. The thing with solar panels was if there was no sun out then there would be no power to the temperature sensor. We hit this temporary road block but then figured it out. Why not use both ideas we came up with. We would use a rechargeable battery to power the device and use a solar panel to charge the rechargeable battery. We choose to go with a 3.3V rechargeable battery and a 5.0V solar panel. One issue that come up was that the solar panel would transmit voltage at 5 volts and the battery would only hold 3.3 volts, and if directly connected, the solar panel will overload the battery. This was a problem. We decided to use a solar lithium polymer charger. This device would have a capacitor on it that would convert the 5 volts to the 3.3 volts. This would be the median in which the temperature sensor, rechargeable battery and solar panel will be connected to make it all run in unison. Now that parts have been chosen it was time to solder the components that were need.

The first thing that need soldering was the solar lithium polymer charger. The solar lithium polymer charger had to be solder together and also the connectors we were going to use to plug into the charger. For the NeoPixel Ring, we had to solder wire onto it to connect it the breadboard. At times it was difficult to solder the NeoPixel. There were parts that were hard to reach and you could possibly damage parts of the equipment if came in contact with extreme heat. This was very true when it came to soldering the Xbee and the temperature sensor to the solder able breadboard. I had to be very careful even though much of the soldering was already done for this piece, I still had to do some touch ups on the previous solder job. It was really tough to redo someone else solder job. The individuals that did it before me had large chunks of solder which I had to remove and redo. They would burn the plastic that cover the wires so it would be embedded in the solder. I had to figure out if what they did was necessary or was done to cover up a mistake. It was often very stressful because you did not want to the ruin the Xbee or any other pieces. It was a great learning experience and I got to refine my soldering skills. After we got everything solder, it was time to decide the setup of our two parts.

For the temperature sensor we decide to go with the rechargeable battery and the temperature sensor on one side of the solar lithium polymer charger. On the opposite end would be the solar panel. Even though we did not do this in our final presentation we were planning on having the battery and temperature sensor inside a weather proof case. The solar panel could be outside of the case because it was made already to be weather proof. This would be the optimal way we would want the temperature sensor to be displayed as. For the receiver, we would use a breadboard with the Xbee and the Neopixel ring. The breadboard will be communicating with an Arduino to collect data and also to receiver power from the Arduino. We decided to power the receiver by plugging into a direct power source since it is going to be inside the user’s home. We did not do this but for future plans, we would get a small wooden board to screw on the Arduino and the breadboard. This way the piece would be easily moved around in the user’s home. After we solidified the physical build of our project it was time to code it.

I did much of the hardware parts of the project but it was also my job to look up libraries for specific parts like the Xbee or NeoPixel ring. By doing this we were able to get more work done in a short amount of time. I would then look over code and try to find which ports would be best to transmit the data to. We often had to go through software and hardware components to try and figure out what would work for us. One time the data that was being transferred was repeating so we decided to check the hardware first everything was fine. Then we moved on to the software it turned out that that port that was being called was the wrong port that was on the hardware side. Once we changed the port the data was being sent find without a problem. It took the two of us to figure that out. We had to teach ourselves how to use the NeoPixel ring. We had to understand how to use RGB color schemes in the library that was given to us and how the NeoPixel ring was able to read the inputs we put into it. While we were working on the project we also researched other competitors or products that were similar to ours.

From the research we conducted our product offers something new to the table. We have found that our competitor only displays the numbers using and LCD screen or use a small monitor that is very clutter with unnecessary things takes up a decent amount of space. We offer the best of both worlds with a user friendly interface with a cool modern take on the temperature display. We use a cool ring lighting system with engages the user to our product by keeping them informed about the temperature but also entertained by the visual light show they are delivered. At first our product will not be cheap to make with it hitting the $100 mark but over time we can bring the price down to be lower than our competitors buy making in bulk. Our competitors range from $20 to $100. We want to hit the middle mark so we can give the consumer a reliable product at an economical price. All in all, I enjoyed this project and was very interesting learning how hardware and software have to work together in order to create a cool device.

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