

SMOKE AWAY

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PROBLEM STATEMENT

The main issue that we are focusing on is drug abuse prevention in public properties especially school environments. There has been a rapid increase in the amount of students using drugs recreationally especially with the introduction of vapes and JUULs. The main area where people tend to smoke are the bathrooms, as it is a place they feel they can hide from staff without being caught. This has become a major issue for schools because it causes the schools to have to divert security to stopping or catching drug abusers or locking the bathrooms, limiting use to other students. Another major issue is that the "smoke" from these drugs trigger the smoke alarms which causes the fire department to get mobilized. This wastes time and city tax dollars. The market this product is directed to is schools and staff that want to eliminate the issue of drug use on campus. It gives the school system an opportunity to not only catch the act in its tracks, but also to preserve their image as a smoke/vape-free campus. The detector will work not only to identify smoke, but also vapor as well, so the range is broadened. It will set off a silent alarm and notify the staff to deal with it appropriately.

JUSTIFICATION

The reason why we are doing this is because drugs have become a huge issue in our country. Specifically it is an issue that affects the youth of America. According to drugabuse.gov, 35.6% of 12 graders have used marijuana at one point or another. And 6% have reported that they use it on the daily. Furthermore, in an anonymous survey given to over 1000 students between the age of 12 and 17, it was found that over 18% have used a JUUL at school (truthinitiative.org). And these numbers are only continuing to rise. While the case can be made that recreational drug use should be made legal for home use, there is no case that can be made for use at school. Not only are you harming your fellow classmates with the secondhand effects, but you are also taking a learning environment and lowering its value. In our school specifically the school has simply proceeded to lock bathrooms in an attempt to stop drug use. Beyond just being unhygienic, it also shows that the majority will be punished by the few and the nicotine addicted. Finally, the last reason why we are doing this is because if kids are caught at school where there will be guaranteed disciplinary action, it might make them give up the harmful substance and get the help that they need. According to the truth initiative, one JUUL pod has the same nicotine as 20 cigarettes. Such nicotine combined with the young age of most users leads to harmed brain development, altered nerve cell functioning and an increase in the risk of young people smoking cigarettes. In fact, young people who use e-cigarettes are four times more likely to go on to smoke cigarettes than their peers who do not vape.

SIMILAR SOLUTIONS

There isn't anything else tried that works like our system for the bathroom situation. The only thing that has really been attempted is having security guards do random checks of bathrooms and sweeps. There was a patent for drug detection in cars, but that is very different from our design and idea. There is also the Netatmo Smart Smoke Alarm.

PROS:

- The Netatmo is low-energy Bluetooth
- It sends notifications from your fire alarm in real time
- You can adjust settings and fix the problem when you are away from home

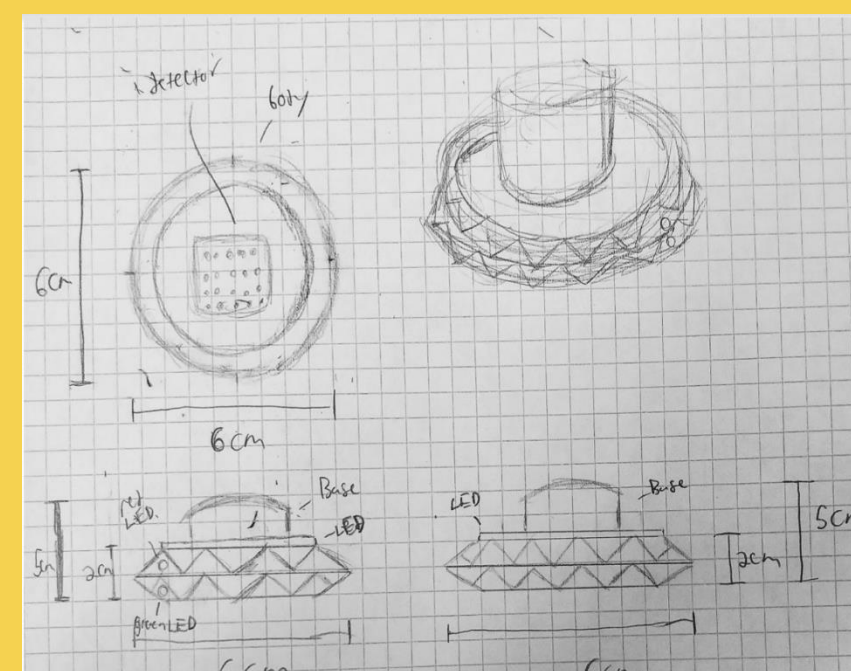
CONS:

- It doesn't show statistics of how much smoke is being detected and the time it was detected
- It cannot be used in schools because it doesn't tell you the location it is detecting
- It is a Norwegian product only being used in Norway

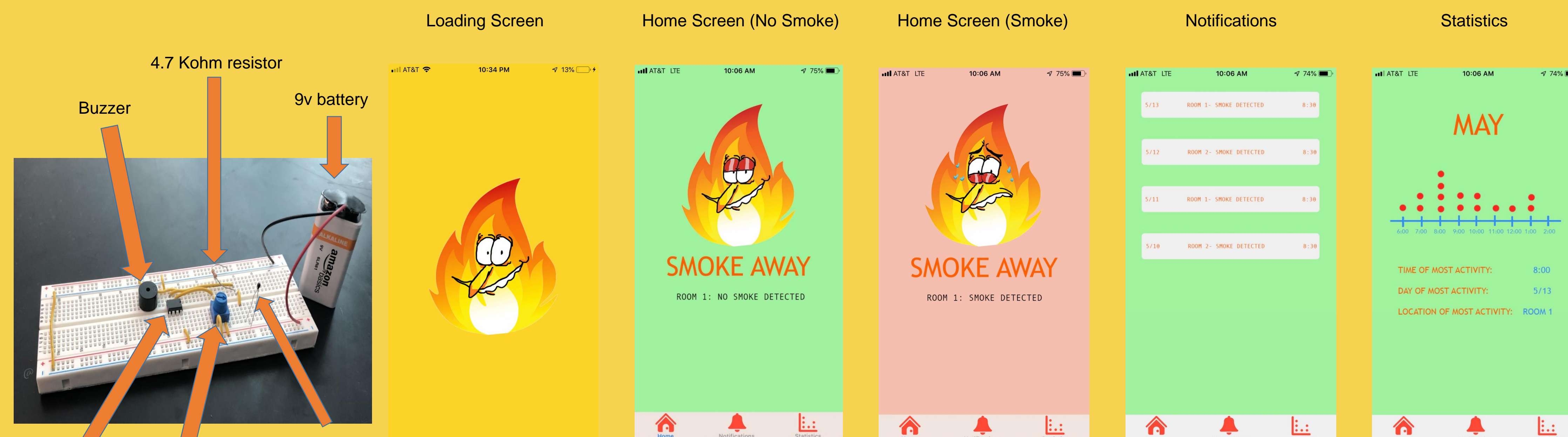


DESIGN CRITERIA

Our target consumers are schools and other facilities that want to keep a no drug policy on their properties while not having to alert the fire department every time someone wants to light a cigarette. This can be from government buildings to private organizations. Our product is designed to assist in enforcing no smoking rules in hard to monitor areas, such as bathrooms, locker rooms, and even classrooms. We want our alarm to be small, light, easy to install, and unnoticeable. The device must be able to accurately identify smoke and warn security before the smoke alarm gets triggered.

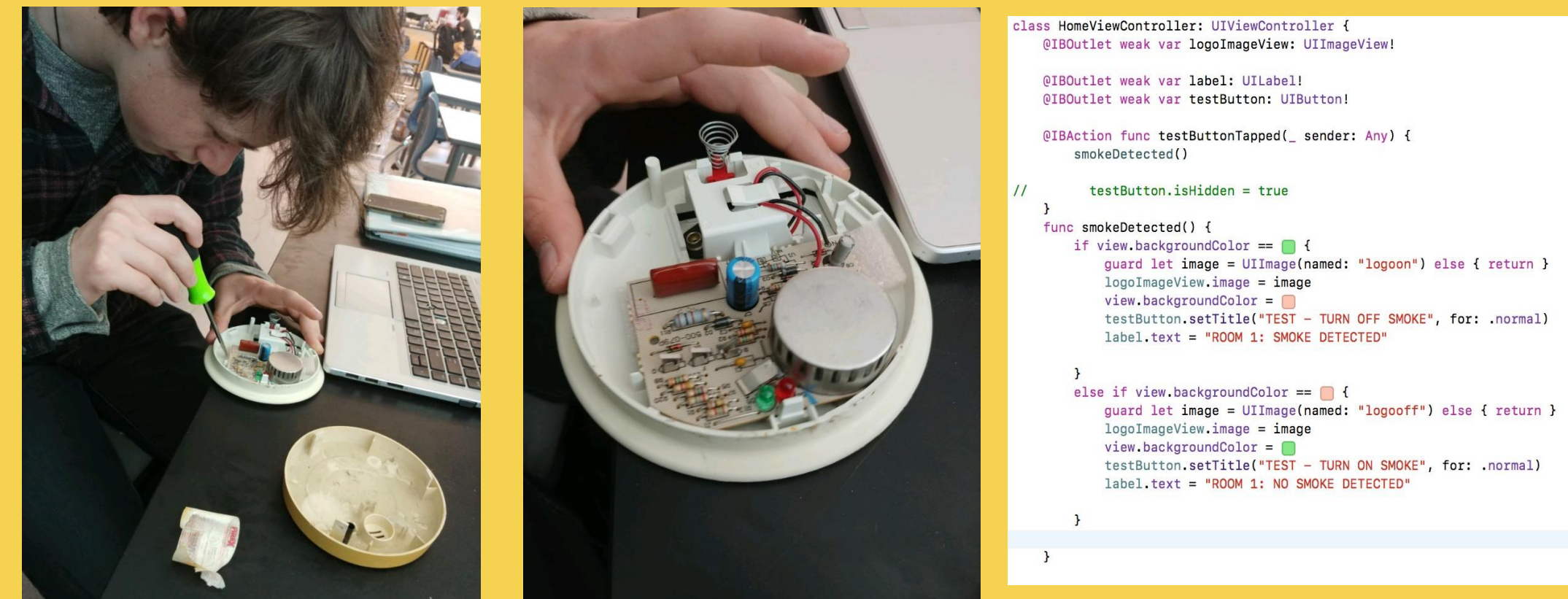


FINAL PROTOTYPE



The final app prototype – SmokeAway

PROTOTYPE BUILD



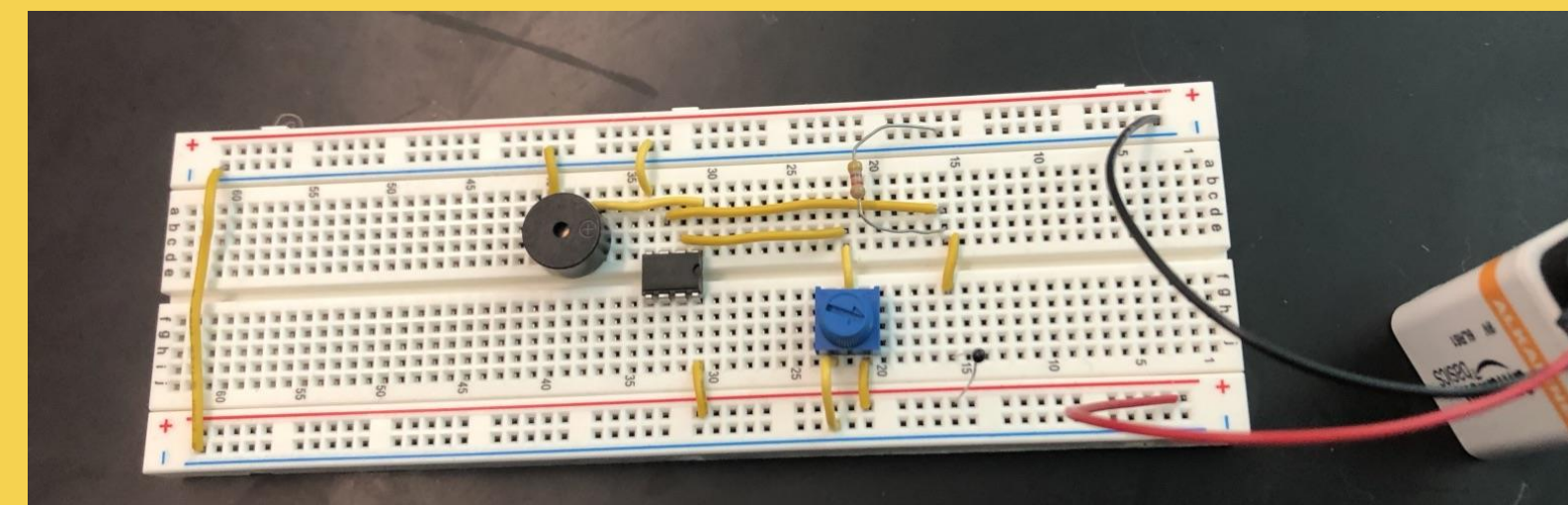
```

class HomeScreenController : UIViewController {
  @IBOutlet weak var logoImage: UIImageView!
  @IBOutlet weak var label: UILabel!
  @IBOutlet weak var testButton: UIButton!

  @IBAction func testButtonPressed(sender: Any?) {
    sendActionToServer()
  }

  func smokeDetected() {
    if view.backgroundColor == UIColor.white {
      guard let image = UIImage(named: "smoke") else { return }
      logoImage.image = image
      view.backgroundColor = UIColor.black
      testButton.setTitle("STOP", for: UIControl.State.normal)
      label.text = "ROOM 1: SMOKE DETECTED"
    }
  }
}

```



TESTING PROCEDURES



App Compatibility- We will test to see if the app links to the Adafruit Wi-Fi Breakout, and make sure it sends a signal to the app that will be coded to generate an alert. We will also test to see if the detector sends a signal to the Adafruit after a substance is detected, or the detector is switched "ON". If 1=ON and 0=OFF, and the detector generates a 1, then we check to see if the Adafruit is notified.

Functionality of Detector- We will test to see if the detector works properly. It works properly if the smoke/steam sensor accurately indicates when a substance has been released/when it has been exposed to said substance.

Distance from Substance- We will test the prototype to see how much distance is required in order to set off the system's silent signal. We will test this in different environments to see which is the most effective, and which environment has the least amount of unaccounted for variables. We will mount/place the detector in different parts of a bathroom and see which one captures the true number of times a substance is released into the air.

App Notification/Display- We will test our prototype and make sure that the app is able to process the information from the Adafruit Wi-Fi Breakout. We will make sure of this by using an extension to XCode (the software used to code the app) called "embed XCode" that ensures the connection between the circuit board and the app. We will test to see if the Adafruit is able to send a notification that is generated by the app. Also we will test to see if the graphs showing which bathroom has the most substance use (over a period of 30 days), are accurate to reality.

App Use- We will test the prototype to make sure that the app is easy to use and has proper functionality. We will also test if it is able to be conveniently downloaded on an iOS device. These can be tested through the coding program itself (XCode) and by downloading it onto our own devices to see if it works.

CONCLUSION

In conclusion, there are things that could be improved about the SmokeAway smart smoke detector in the future. The items that posed the biggest challenge was the Adafruit Wi-Fi Breakout, and making sure there was a strong connection to the app. Also, making sure the connection between the smoke detector itself and the component posed a challenge. We overcame them through testing and using different resources to figure out how to best tackle them.

Finding the materials to use was also difficult, and making sure the parts were being used properly. Our use of materials was relatively cost effective, as we have components that are cheap and easy to obtain. We made sure we were as cost effective as possible by trying to determine the needed use of products early on.

Making the app was difficult in terms of trouble-shooting code, and making sure everything functioned properly. This was achieved through excessive testing.

We made sure that our prototype is functional, and meets the criteria that we established in the beginning. Knowing our consumer/clientele shaped the way we developed everything about the project. We wanted to make sure that we could develop an effective detector that has app connectivity, and an app that's easy and simple to use. The idea is to catch drug abusers at school in the most common place it is done, bathrooms. With the SmokeAway app we have created a way that faculty and staff can catch perpetrators before the regular smoke alarm does. We identified the problem of smoke alarms going off frequently during class time, and tried to resolve this issue by the means of creating a whole different, revolutionized, silent smoke detector. We hope that with the prototype we've created, we can put an end to drug use on campus, or at least discourage it.

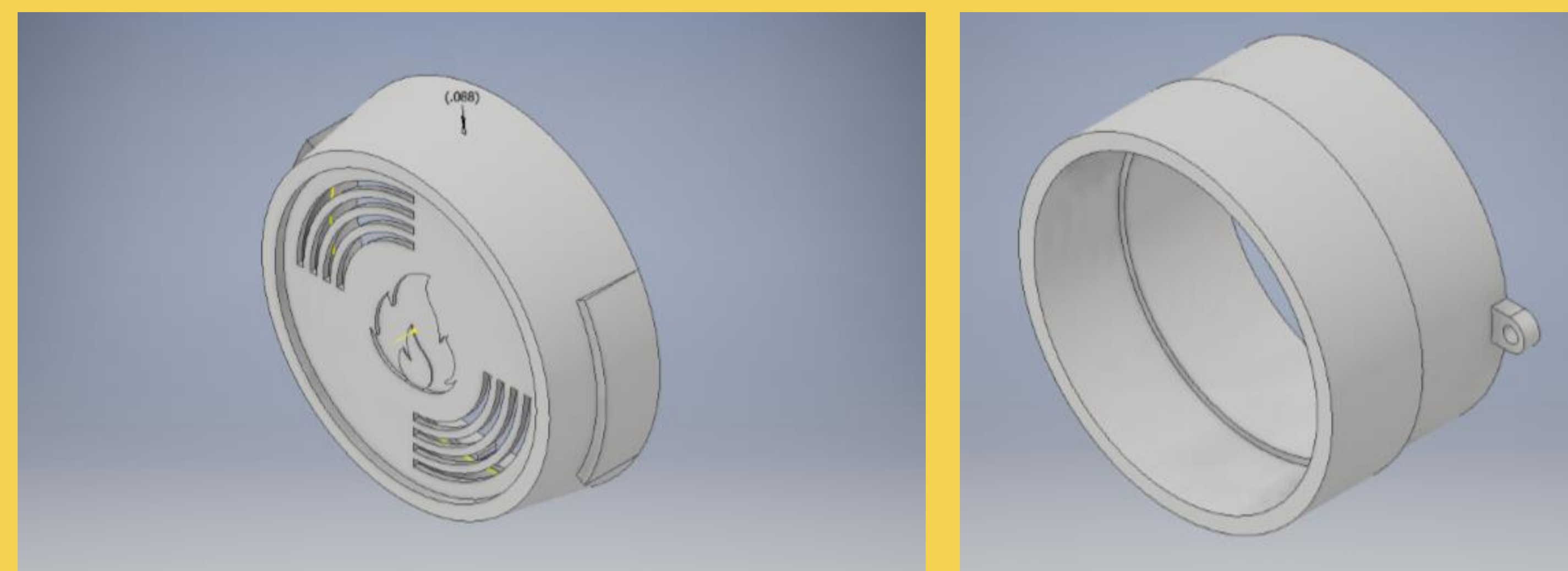
MODIFICATIONS

For next steps and modifications we would try to make the entire system smaller. Our group would modify the system to be run with Bluetooth instead of the Adafruit Wi-Fi Breakout system we have in place. We would also make the detector a low energy core Bluetooth system and would expand the amount of substances the detector can identify. Included in this would be vapor and different types of smokes/gases.

We would also make sure the detector has better detection of questionable substances. This way, we would widen the range of its detection so that it can detect it at a ceiling level even if the activity is closer to the ground. We also want to make it so that it has the ability to deactivate the fire alarm in that room if vapor is detected, to remove the possibility of an accidental alarm entirely.

We would expand its capabilities in different types of detection, and see how long it can last without needing battery changes/maintenance.

C.A.D. FILES

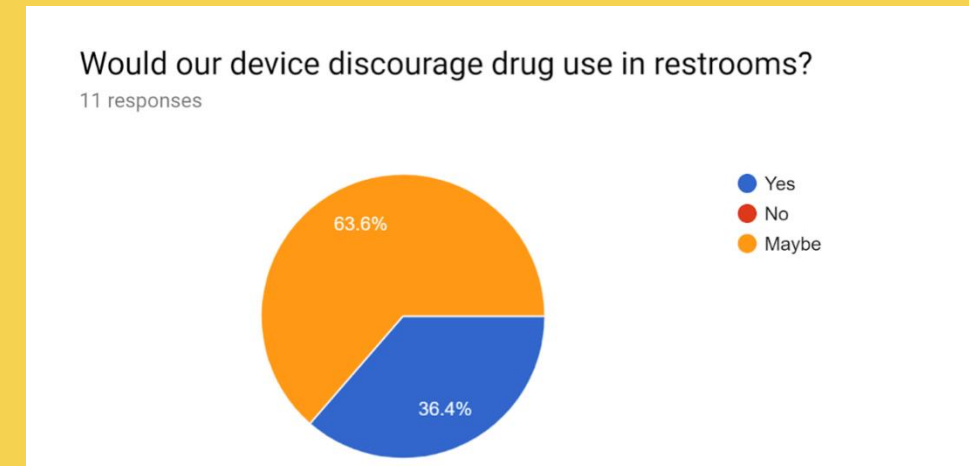
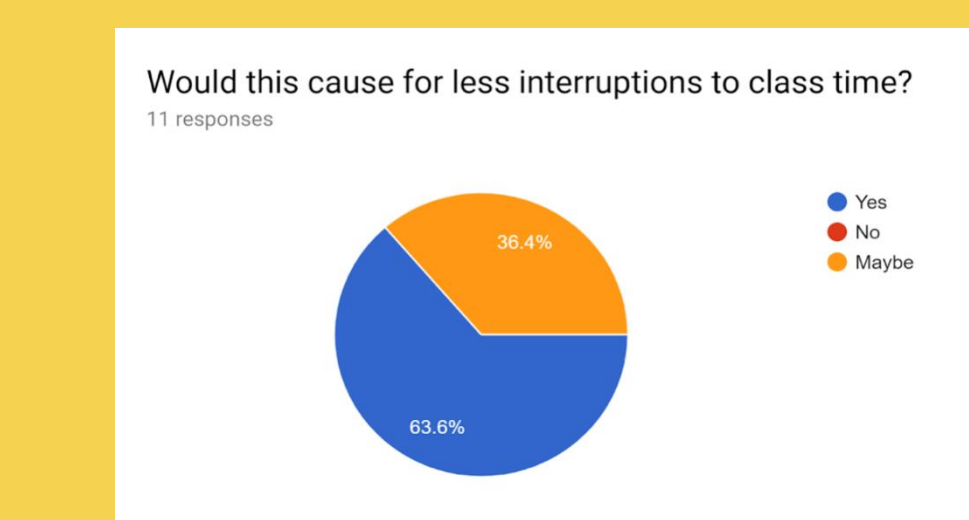


These were the 3D figures that were to represent the final body of the smoke detector. We wanted a sleek design that would be somewhat low profile, but would also be easily recognizable.

The front face is supposed to be able to allow smoke to enter through the vents, while also keeping the electronics away from the smoke, or anyone that would tamper with it. The larger housing piece is to connect the detector to the wall, while also keeping the internals secure.

The body helped us in our design a lot because it gave us an endgame, something to aim towards. Eventually this will be what the product will look like, or something close to it.

TESTING RESULTS



In terms of feedback, we received a lot of positive responses. Most of the respondents answered "Yes" to the device causing less interruptions. We received a lot of the "Maybe" response. We predict this is due to it's implementation not being fully complete, so it is unknown whether or not it will discourage drug use in restrooms. We are confident though that once it is implemented fully, the results will be positive.