



Element K

Problem Statement

One in six women are a victim of sexual assault. Women from the ages 18 to 24 who don't have the physical means to fight back are the ones most commonly attacked. The victims afterwards then suffer mentally, physically, and financially for something that they weren't responsible for.

Introduction

Throughout the class, we went through a larger scale design process than we ever had before. We brainstormed, sketched, designed, and tested a product that we thought of and were able to create to help solve our problem. While sexual assault is such a big worldwide issue that it likely will never be solved, I do think that if our product was put on the market it would help improve it. This project has taught us a lot of things like the value of teamwork and how to work together to get the job done. The only problems that we faced were with time management, and the distraction that is procrastination.

Reflections on the Elements

A- In this element, we picked our problem statement, introduced our problem, found statistics and experts, did market research, and found scholarly articles that proved that our project met all of the attack paths. This helped us really get a grasp on how big of a problem we were wanting to address was.

B- In this element, we did patent research on some of the most common products used against sexual assault and then did market research on them to see how they were doing, and how we could beat or improve them based on complaints and reviews. This helped us learn more about our "competition" and what things we could do in our project.

C- In this element, we first decided what path we would take with our product, and we landed on a weapon, before we decided on our design requirements and benchmarks, before we found two experts and got their opinions. This helped us start to narrow down what our project would be and start to pick important things about it.

D- In this element, we all developed 10 sketches, before we talked them over and narrowed them down to three from each person, before we put them all in a decision matrix against each other and products on the market. The product that won out was the hidden blade ring, and from there we decided that the prototype would be made out of ABS plastic (3D printed material). This element helped us make a lot of decisions about our product, we decided what it would be and what it would be made of.

E- In this element, we listed all of the STEM principles that we used in the project. Science- nothing, Technology- inventor, the 3D printer, and microsoft, Engineering- brainstorming, mock-up, and building, Math- density, volume, area, and tolerance. This helped us get our prototype together and learn things about it.

F- In this element, we decided the cost to manufacture our product is 55¢ plus the cost of machinery to mass produce. The market size is 26.5 million people. The possible market share will be about 1%. The purchase price is \$12. Our distribution options will be online and through the mail. We will face a few obstacles while attempting to put our product on the market, like competition and possible lack of name recognition. Our plan to overcome these obstacles is good marketing so that it can get our name out there as well as our product which would help us against the competition.

G- In this element, we state, in detail, the materials and construction of our prototype. We utilized Inventor to create our first prototype and 3D printed multiple rings with lids. We had to print multiple rings due to the different sizes of our fingers and the caps breaking. We finally made the perfect prototypes for testing with our design requirements.

H- In this element, the prototype was expected to meet all of these criteria; It needs to be discrete, be accessed in seconds, unbreakable, and it can cause harm without being lethal. This set of criteria was to be tested due to the problem of sexual assault and allow us to see if our product is reasonable.

I- In this element, we tested our product in 4 different trials; discreteness, accessibility, durability, and harmfulness. Overall the ring performed well with the given circumstances. The safety concern of the prototype made it to where the tests could not be as accurate as possible but they did justify that the solution is reasonable.

J- In this element, we met again with our experts and got feedback from them and consumers as well, and made our powerpoint, pamphlet, and poster. The feedback was amazing and gives a basis for potentially patenting and distributing the product in the future.

Prioritized Recommendation

The main recommendation for others would be time management. We procrastinated way too much and had to squeeze everything together at the very last minute. If we would have managed our time better, we would have had more time to practice our presentation. Another recommendation would be to have the proper machinery to manufacture a quality product that

could be mass produced. We didn't have the proper machinery or skills to manufacture one. This would have allowed for more accurate testing and a more accurate prototype.

Conclusion

This was a really good class to have, and a great experience to have gone through. We were able to brainstorm, sketch, design, and test a product that we thought of and were able to create to help solve our problem. Working together as a team to get our project done has been one of the most valuable lessons we have learned from this class. The main advice we would give to someone working through the engineering design process would be to stay on task. We would also recommend to make sure that there is a lot of communication in your group, if you have teammates, so that everyone has a voice in your project.