

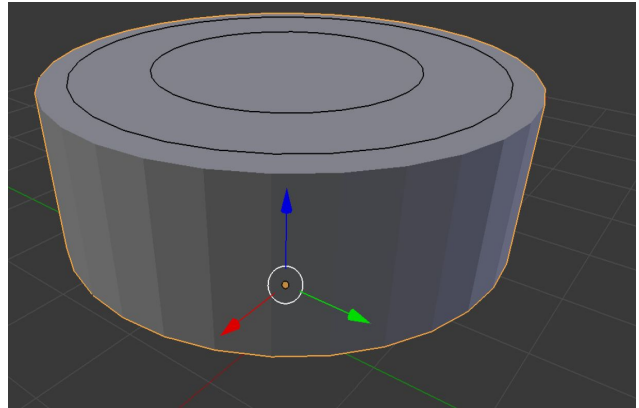
FIEZO

push • click • focus • charge

Research and Development Official Report

Project Idea

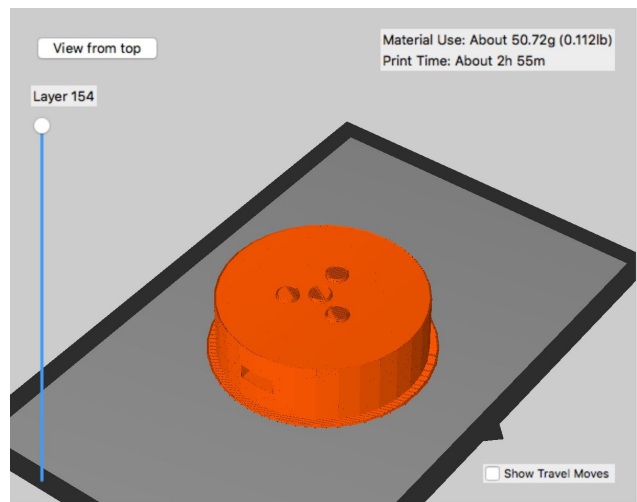
Our product focuses on people who have trouble focusing in school. Especially people with ADD and ADHD. Kids like this usually need to play with something while they work to help them focus. We have created a model device that has interactive surfaces to fidget with. To add on to that, we have incorporated piezoelectric elements to create power as you play with this device. There is a USB function on the device so you can power things on the go.



Applications

- Classroom setting
- Business or workplace
- At home doing homework
- Anytime you need to focus

Once the strip is contorted and the piezos give off electricity, a wire connecting all of the elements transfers the energy to a capacitor. The energy can then be used through a USB port to power several different devices.



Piezoelectric elements are a form of completely clean energy. The burning of fossil fuels today is causing pollution and contributing to global warming. Although piezoelectric elements do not create a large amount of power, they should be used wherever they can, so we can avoid burning these fossil fuels.

Research and Development

Guiding concept:

The team wondered how we could capitalize on the growing trend of fidget tools and how to capture the energy generated from idol taps and clicks on the devices.

How it works:

The Fiezo device works by fidgeting. When you press the buttons on the product it compresses the piezoelectric elements inside. When the piezos are pressed the energy volts flow into the capacitor that will be connected. When you plug your phone into the USB, the electricity goes into your phone and charges it.

Our hypothesis was that if we made a product that charges your devices while fidgeting then the person using the Fiezo will be more focused and their electronics will be charged. Our Fiezo team feels that we accomplished our hypothesis because we have done lots of research backing up the fact that this device will be used and helpful for high school aged students. We would like to conduct further research to see if other age ranges will use this device.

The growing world of piezos

Piezoelectric elements have come a long way since they were founded in 1880. They are now a widely used technology and are being used in the following fields:

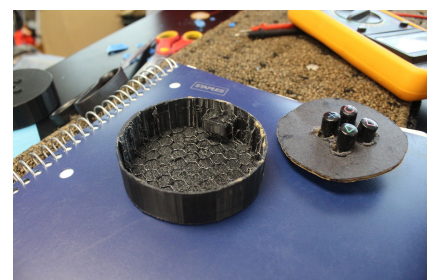
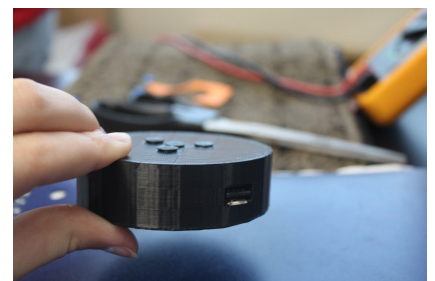
- Industrial and manufacturing
- Automotive
- Telecommunications
- Medical instruments

After reviewing piezo elements wide applications the Fiezo team is excited about the growing technology. Given more time and resources we would like to implement higher charged piezos and would like to further expand our idea.

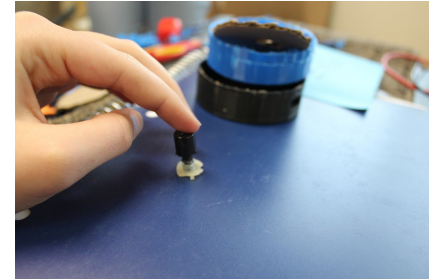
Process

The process of making the Fiezo product-

1. We made a 3D model and printed it
2. We took gutted out our 3D model and decided what to put inside



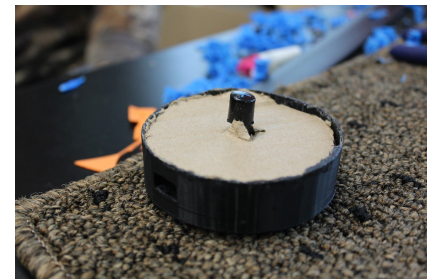
3. Then we did research on what material generated the most energy. We noticed that only putting buttons on the top of the Fiezo wouldn't reach all of the piezos. So we printed a new prototype and made two holes, one in the bottom and one on the top. Instead of using the arrow buttons we decided that using the individual ones would produce more energy when using buttons on both sides.



- a. The buttons we tested were from a playstation remote
- b. The buttons generated anywhere from .8-11 volts of energy
- c. The arrow button produced the most energy with about 11 volts
- d. We decided on the individual buttons because we thought they felt better than the arrow buttons and still created enough energy

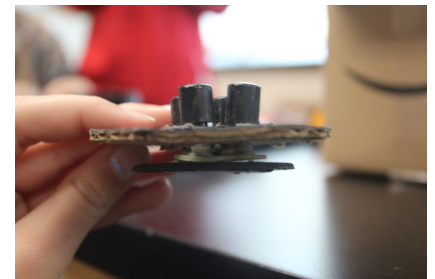


4. Then we researched what material would be used to surround the inside parts



5. After we constructed the device and we figured out how we were going to fit the piezos inside. We consulted with a science teacher in our school about how the piezos work and what materials produce the most energy.

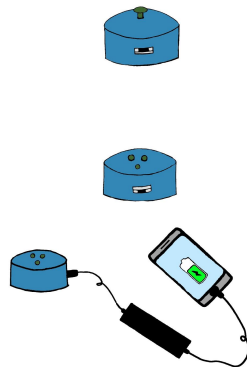
- a. Since we didn't have working piezos at the time of taking this last picture on the right, we constructed a model of a piezo connected to the buttons and the top to see how many piezoelectric elements would fit in the Fiezo device.



6. Our final prototype is still in progress, but using a breadboard and a multimeter, we have proven that once it is built, it will work.

*Our current model has the capacitor that stores the energy outside of the Fiezo, but with further time and resources we hope that maybe by expo we will develop it into a model with the capacitor inside. This is so you don't have to have two different cords.

Drawing of expected final product:



Our Pitch team went to an honors Science class and received feedback as to how we can improve and make our company better, this is what we found out and what we improved on since then:

- Deficit in our prototype
- Further research about the way the product works
- They wanted to know how long it would take to charge a device in the presentation, (which would be about 30 minutes)
- They want to know how much energy each piezo creates by one tap in the presentation
- More quantitative data in the presentation

Controversy Over Fidget Devices

Fidget devices have been in the news a lot lately because they are claimed to be a distraction in class. At team Fiezo we beg to differ. Here are some reasons about why fidget devices are so good:

- Good Social Activity
 - Kids like to be a part of what's going on. Fidget devices are blowing up right now and kids love to be a part of things like this
- Sensory Help
 - Similar to play therapy, children tend to subconsciously remember things better when they are moving.
- Most importantly, it helps you focus.

Expert Q&A

1. Is the product safe? How do you ensure that it is?

Our product will not be harmful in any way. We can ensure this because the final product will be coated in an insulator once it is finished. This will most likely be a rubber spray so that it fits the shape of the Fiezo and can be insulated by the rubber.

2. Is it going to be hard to compress the piezos? What material will we use so it is not?

We have experimented with different buttons and things so that we will be able to get the most voltage out of the piezo's. The piezos are thin and are not hard to manipulate. We found that is the best material for our button because it feels nice and produces the most voltage.

3. What will we be using to store the energy? Why is this the best choice?

We will be using capacitor to store the energy. A capacitor is a bulb like device that's inside the Fiezo that we will be using to store the energy. The capacitor stores 220 microfarads. The piezo that's inside the device is connected to the end of the capacitor which is inside a portable charger and when the cord that's plugged into the charger connects to the phone it releases the energy to the phone. We decided to use a portable charger because it has already working parts that we can change slightly to work to our advantage.

4. What will be in between the piezos?

It will most likely be some type of styrofoam in between the piezos. This will make sure that the piezos don't rub up against each other while still being able to move the piezos.

5. How many piezos will we be putting in the product?

We are going to put as many piezos as possible into the device in order to harvest the most energy. The piezos that we put in will be arranged in a parallel circuit or stacked on top of each other.

Cost/Mathmatics

Material	Cost \$	Vendor
Casing (plastic pellets)	50lbs- \$69.99 Use 1/2 a pound for 1 Fiezo so for one piezo it would be \$0.70 * further testing may prove that the pellets can be divided by manufacturing more efficiently	Quality plastic pellets
Buttons	10 sets of silicon D pads- \$2.99 For one Fiezo the buttons would cost \$0.30	Ali Express
Piezos	15 piezoelectric elements its \$15.99 Each piezo itself would cost about \$1.07.	Audio well - amazon
Styrofoam	12" x 18" foam craft sheets- \$8.00 for 10 sheets \$0.80 for 1 sheet \$0.14 for 1 Fiezo	Lacrafts.com
Capacitor	\$2.99 for 200 capacitors Approximately \$0.02 for 1 Fiezo	Ali Express
Total Cost For one Fiezo	Approximately \$12.93 for one Fiezo	



Results & Data Analysis: Primary Research

Button Experiment

Team Fiezo wanted to know which button would work the best for creating a charge. We know that piezos release only a small charge, so we wanted to capture the maximum amount of energy.

In addition to adding many piezos to the device, we decided to conduct an experiment to identify the best button for grasping energy.

Data:

Type of button	Trial 1	Trial 2
Playstation individual buttons 	.8 volts	.10 volts
Playstation arrow buttons 	9 volts	11 volts

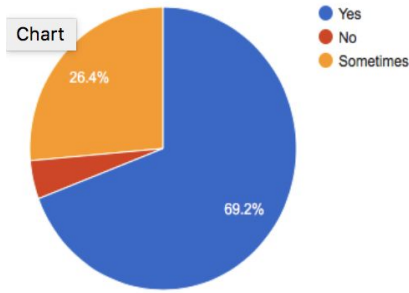
We found that because of the extra surface area, the playstation arrow buttons create the greatest charge.

Surveys

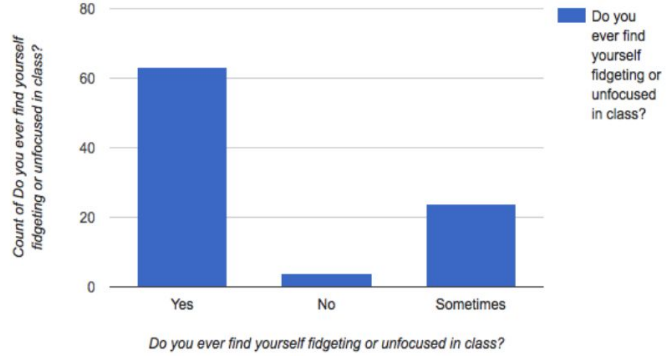
We took a survey with the people in our school during our connections class asking if they would ever use a fidget device to keep themselves focused and if they ever find themselves fidgeting in class. A total of 91 people answered the questions with the majority being yes for both questions.

These diagrams show the results we received from the survey. After receiving the results we put the data into two different types of graphs, a bar graph and a pie chart.

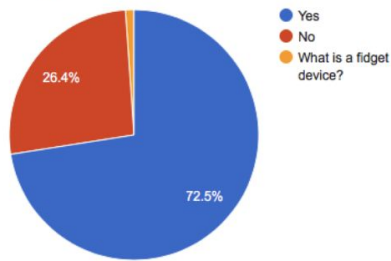
Count of Do you ever find yourself fidgeting or unfocused in class?



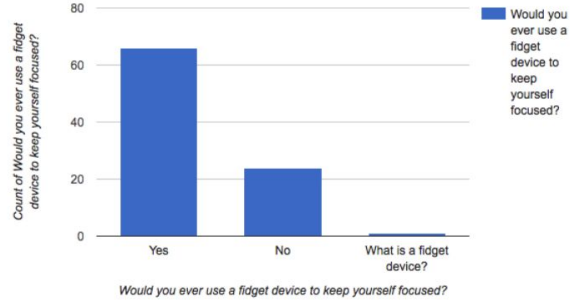
Count of Do you ever find yourself fidgeting or unfocused in class?



Count of Would you ever use a fidget device to keep yourself focused?



Count of Would you ever use a fidget device to keep yourself focused?

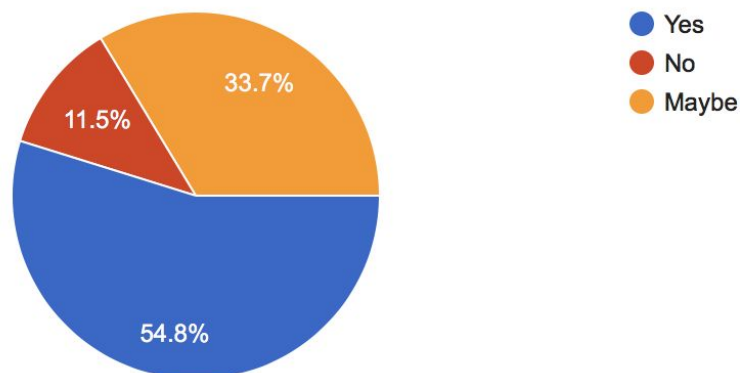


The majority of the people in Wamogo Regional High School voted towards the idea of using the fidget device. When the question, if they ever find themselves fidgeting with something or if they are unfocused was asked, 69.2 percent of the 91 people that answered said yes they do and 26.4 said sometimes. An even bigger percent of 72.5 said that they would use a fidget device to keep focused.

Based on our primary and secondary research, the team feels strongly that this will be a strong entrepreneurial business.

Would you use a portable charger (power bank) for your device?

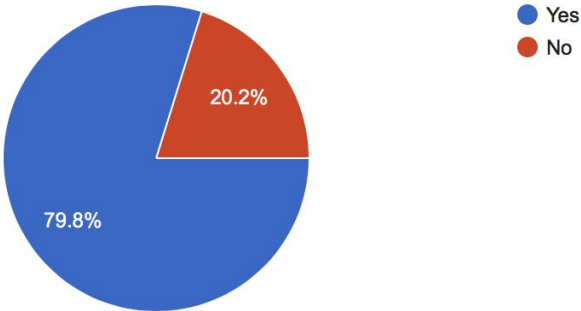
104 responses



This survey clearly proves the need for energy among our target audience. It is important that we know our fresh perspective is a useful device that would actually work. With 79.8% of students saying they need to recharge by the end of the day, we can clearly tell that this is a great product that people will actually buy.

Do you need to charge a device such as a phone, tablet or laptop by the end of the school day?

104 responses



The Focus Problem

Teenagers face multiple distractions and obstacles when learning

Beyondbooksmart.com

Observations of Teens Studying

Over 15
minute time
period



● Time spent studying ● Time on technology/distracted

80 Percent of students report switching between studying and technology

1/3 Students, ages 8-18 text, listen to music or use social media while doing homework

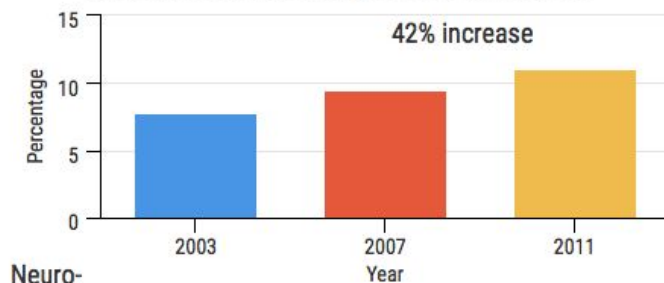
Beyondbooksmart.com

cdc.gov

6.4
Million Kids in the
U.S. are diagnosed
with ADHD

11%
Children of the 6.4
million are 4-17 years
of age

Increase of kids diagnosed with ADHD



Neuro-

10 The percentage of class time students use their devices for non-learning purposes

Seattlepi.com

EVERYTHING YOU NEED TO KNOW

Piezoelectric Disc

● What is a piezoelectric disc?

A piezoelectric disc is a small disc with crystals in it. When you press of them or put pressure on it in any way, it generates volts of energy that create enough energy to fill a tiny battery. explainthatstuff.com



FUN FACTS

● 1880

Two French physicists, brothers Pierre and Paul-Jacques Curie discovered piezoelectric elements

● Weird places piezo elements are found

- Birthday cards
- Microphones
- Voice commands in computers

● Piezoelectric elements were used in World War 1

tmptechnovation.blogspot.com
explainthatstuff.com

bounceenergy.com

Piezoelectric Discs Act as Transducers

Transducers are a device that converts mechanical energy to electrical energy. The piezoelectric discs act as a transducer in the product its used in.

● How it works

When the piezoelectric element is manipulated in any way it forces out an electrical current into a capacitor. Which will store the energy created

explainthatstuff.com

Website and Social Media Links

Twitter: <https://twitter.com/FiezoFiezo21?lang=en>

Gmail: FiezoFiezo21@gmail.com

Instagram: https://www.instagram.com/Fiezo_skillz21/?hl=en

Fiezo website: <http://Fiezo.weebly.com/contact.html>

Marketing and Image

The Fiezo is a consumer product. We are specifically targeting people who have trouble focusing as they work. It has a side benefit of creating energy. We have marketed our product by:

- Making several social media platforms such as instagram and twitter
- Making a website that shows our journey through the process and displays our company
- Making a commercial that promotes our product with visuals and audio
- Making several podcasts that could be used on the radio to promote our product

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