The Locker
Anti-Jam

The best method to prevent lockers from jamming

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Defining the Problem

Students need a device to prevent their school lockers from jamming (getting stuck in the closed position) because when their lockers jam they have to miss class time getting a member of staff to help open it so they can get their materials and textbooks for the next class.

I am a busy middle school student myself so I know how this problem affects a student’s education and school experience. When my locker jams, I have to find a janitor to help open it for me so I can get my supplies for class, which can take at least five to seven minutes. Or, I have to repeatedly kick my locker hoping it opens and potentially breaking my locker. When my locker jams shut (which happens frequently), I have missed several minutes of essential class time, bothered school maintenance for help, potentially damaged my locker by hitting it and pulling at it, and also felt extremely frustrated.
Background Research

How much would a student be willing to pay for a Locker Anti-Jam?

Locker accessories seem to be widely popular, especially among female students (Gootman). This means students would be willing to purchase it. Based on the target website most locker accessories go for around 5 dollars. So students will probably be willing to pay five dollars for a Locker Anti-Jam.


Background Research

How often does a student’s locker normally jam and is there a market for the Locker Anti-Jam?

I did a survey of 200 of the kids at my middle school and 27 of them said their lockers have jammed in the past month. They all agreed it was a major time-consuming problem that students faced and on average would be willing to pay 3 dollars for an appliance that would prevent their lockers from jamming.

My middle school administration also expressed interest in the Locker Anti-Jam to sell in the school store.
Background Research

How often does a student’s locker normally jam and is there a market for the Locker Anti-Jam?

Here are what some of the students I surveyed said:
How does a locker work?

The lock on a locker is a series of rotating wheels (1 for each number in the combination) that when your combination is entered they align. When they are aligned, the lock opens allowing you to open your locker.

Background Research

Why does a locker jam?

Through studying my own locker I found that when the lock opens it moves a latch up which allows the locker to open. If this latch gets blocked or stuck by coat, a purse, or a backpack then the locker will become jammed. So the student will no longer be able to open their locker.
Specify Requirements

Physical requirements

The Locker Anti-Jam has to prevent the locker from getting stuck in the closed position. To do this, it must prevent anything from being stuck inside of the lockers latch. It also must be small enough to not get in the way of the locker latch or irritate the student who has it in their locker. If it is too bulky, the student using it won’t have enough room for their belongings in the locker.
Specify Requirements

Financial requirements

The Locker Anti-Jam must also be three dollars or less due to the survey I took at my school. So it has to use as little 3D printer filament as possible in its design and be printed with an inexpensive material.
Brainstorm solutions

01. I could design a thin shelf to cover the latch of the locker which will prevent material from being stuck in or blocking it, therefore preventing locker jams.

02. I could design a panel that covers the whole locking system inside the locker which will also prevent jams by not allowing material to get stuck in or block the latch.
Solution 1 -
This solution should be simple to design and prevent a locker from jamming. It would use a small amount of material and is not very bulky. Therefore, it is likely to be inexpensive.

Solution 2 -
This solution should be simple to design and prevent a locker from jamming. Although, it would use a lot of material making it bulky and possibly more costly.
Develop the Solution

I took the measurements of my lockers latch system and found that my solution should look like this:
Develop the Solution

I created my solution using Tinkercad and plugged in the measurements I took earlier to create this: Prototype 1.
Develop the Solution

I went to the local library to print out my design on a 3D printer. I chose the cheapest filament they had which was PLA since my design could be made from any material. I printed it out successfully. It had a mass of 6 grams and since the rate for this filament was 25 cents per gram this version of the locker anti jam was 1 dollar and 50 cents to construct.
I tried the Prototype 1 version of the Locker Anti-Jam out on my locker and it didn’t fit! The legs (or side panels) were not long enough. I knew on my next version I would have to make them longer.
Develop the Solution

I made the legs (side panels) longer on prototype 2 using Tinkercad of the Locker Anti-Jam and the new design looks like this:
Develop the Solution

I went to the local library to create Prototype 2 using Tinkercad and this time they had black nylon filament. It costs the same as the white PLA but is more flexible so it would fit on the latch area of my locker easier. It weighed 8 grams so it cost 2 dollars.
I tried the prototype 2 version of the Locker Anti-Jam out on my locker and it kept falling off! I realized that this idea for a design wouldn’t work since the arms don’t have the grip required to keep the Anti-Jam on the locker. I knew I had to come up with a new design. I wondered if I could create a sheath that attaches from the side where the latch was. It would be less bulky and therefore less expensive than the other versions and it might stay on the latch.
Develop the Solution

I took the measurements of the locker latch system on the latch side and drew a diagram of what the new solution should look like.
Develop the Solution

I designed it using Tinkercad

and prototype 3 looks like this:
Develop the Solution

I 3D printed it again at the local library out of black nylon again. It only weighed 2 grams and costed 50 cents!
Develop the Solution

It worked! Prototype 3 was perfect. I placed it in my locker and haven’t gotten a jam since! I showed it to some of my friends and we made a short video to communicate my findings.
Conclusion

1. I found a problem that affects at least 20% of the school population at some point during their school years.
2. I created several prototypes with various cost factors until I found the perfect inexpensive solution.
3. I experimented with all 3 prototypes, designed by using measurements and drawings with possible solutions.
4. I went to the local library and by using my drawings and measurements I was able to recreate my idea on Tinkercad a 3D printing program.
5. I did Trial and Error on all 3 prototypes to find the best possible solution and was happy to see it was also the most cost effective.
6. I showed that there is a need and a market for this device (by interviewing and surveying 200 students and school administrators). The Locker Anti-Jam with a cost factor of 50 cents and a possible retail of $3.00 dollars would be extremely beneficial for the student buyer and the retail store selling locker supplies.