

## Complex Project: Building A Prototype Sample A2

Hello, my name is [REDACTED], but you can call me [REDACTED] and I am a 6th grader in [REDACTED]! My team, [REDACTED] [REDACTED] made a product for Cocina del Sol. Our client, Cocina del Sol is looking for a device that can bake their Spicy Mayan Chocolate Chip cookies that is using power from the sun. In the other paragraphs I will be explaining what my group's product works, our description of our prototype, and analysis of testing. For the other paragraphs I will be typing how my group's prototype works, how my group designed the prototype, and how our group tested the prototype.

For my team's invention, I brought a metal pan to school and [REDACTED] and [REDACTED] brought tin foil. So, my group covered the middle of the pan with tinfoil and we slanted the tin foil on the all four sides, so the power from the sun will reflect to the cookies that will be on the middle of the pan. We also thought that if our invention will not work we could get mirrors too! We thought mirrors will be great, because it can also reflect the sunlight.

How our invention works is that, the thermal energy, which is the total amount of energy in a substance due to the motion of the particles in the system, from the sun will get attracted from the conductor, which is a material that can conduct heat, electricity, light, or sound, we have which is the tin foil. We thought as we put our invention and tried it out the temperature which is a measure of the average kinetic energy of the particles in a system, increased, the more we waited the more the temperature increased. The tin foil also helps so the sunlight goes directly on the pan, which is also transfer of energy, because the sunlight on the sun is **transferring energy, which is also called heat**, from the sun to the tin foil. Transferring energy is also heat and there is 3 different types of heat transfer which is, radiation, which is the process of heat transferring from one object to another. The 2nd type is, convection, which is the transfer of heat through a gas or liquid where warmer parts move up and colder parts move down. The last

type of transfer of heat is conduction, which is the process of heat transferring from one object to another.

For our invention we brought tin foil and a metal pan. Our invention is made by my team taping tin foil on the center of the pan and we made the tin foil on the sides kind of slanted, so we can make the sun power reflect on our cookies. One piece of evidence I have is that I **saw** and **made** the invention.

My team made this design, because we know that tin foil is a conductor, a conductor, which is a material that can conduct heat, electricity, sound, or light. Another reason why my team made this is, because metal is also a conductor and tin foil also can reflect light. My evidence I have is that about a week ago when our class had a sub for class we gave examples about what were conductors and it told us that tin foil and metal are conductor, the subs also taught us what a conductor does.

Over time we had to change the tin foil on the sides, because [REDACTED] brought better tin foil that our group thought was better than what kind of tin foil we have on the pan previously. We also changed the tin foil, because the tin foil was more shiny than the other tin foil and we thought that the tin foil could attract/reflect more sunlight. Our team also added black paper to the middle of the pan, because yesterday on Wednesday we noticed our team's hair which is all black, was hot as we tested our invention in the sun. We thought that the black paper would also attract the heat from the sun. We saw that if the cookies went on the black paper the ink from the black paper would also turn black, so we took the tin foil that [REDACTED] brought and cut out big and small circles. The reason why we cut out small and big circles is, because if the client we are working for will try the invention the circles of tin foil will attract the heat and the tin foil can not make the cookie dough turn black. The evidence I have is that, I **felt** how hot my hair was as we were testing our product and we think that the cookie dough will turn black from the ink from the paper, because from the past in my life I accidently put water on a black paper and I **saw** that the water turned dark from the ink in the paper.

For our prototype, we tested it by going outside in the sunlight and our team chose a spot where we thought the power from the sun was strong enough. We placed the prototype in the spot where the sun shot directly at the pan, we fixed the tin foil on all sides, so the sun can reflect on the tin foil and on to the center of the pan. Our team was supposed to measure the temperature every 3 minutes and check the thermometer if the warmth increased. Before we checked anything we saw that the pan was 25 C.

For the first 3 minutes there was no difference and it was still 25 C. After 6 minutes, our team saw that the temperature increased to 27 C. After 9-12 minutes the temperature rose to 28 C. Today, Thursday October 9, we had to test our prototype with an artificial sun, because there was no sunlight today and it was pretty cloudy outside. We added black paper and tin foil circles, because the black paper will help attract heat, like our hair and the tin foil circles will help attract heat and will help, so the cookie dough will not get black ink on the dough. In our second test, there was no sun outside and it was quite cloudy outside, so our group had to test out the prototype with an artificial sun/ a heater. Since [REDACTED] was the recorder me and [REDACTED] got a timer and we measured every 2 minutes. [REDACTED] also took the temperature for every 2 minutes. At 2-4 minutes the temperature was 25 C and did not improve. For 6-8 minutes the temperature was 26 C and it improved. At 10 minutes the temperature was 27 C and it did improve.

Our group thought that since we had to use a heater and was not as great as the sun, like we did on the first test, the temperatures did improve but every time it did not improve as much as the first test. If our group had more time, I think we would've put mirrors at an angle, so that the sun can reflect more than the tin foil, because we want the tin foil to act as a conductor, which is the process of heat transferring from one object to another, and the mirrors can reflect the sun, then reflect to the center of the pan where the cookie dough are going to be.

## Complex Project: Building A Prototype

### Sample B2

Hi my name is [REDACTED] me and my partners [REDACTED], we are working for cocina del sol. They are asking for a solar oven, we are making the solar oven out of cardboard. The rest of the papers we are writing for you are about the solar oven. How the solar oven will work we will be explaining how everything works. How you should use the solar oven and what kinds of energy the solar oven needs.

The solar oven works with solar power and it uses thermal energy (thermal energy is the total amount of energy in a substance) by making the cold air that comes in hot air in order to make the cookies cook. The temperature (is the amount of heat something has i know this because when we tried the solar oven we saw that the heat was changing every minute or so and we knew it was the temperature changing every time.) changes every minute and the molecules (are little things moving around they are all over everything. Molecules are groups of atoms in a group together that can not move for example when there is water molecules move way faster then when they are in ice I know this because when you get some water and some ice you can see that the water has more molecules than the ice.) start to move faster every minute. The solar oven also needs kinetic energy (kinetic energy is the because in order to get something to move we need kinetic energy. Kinetic energy is when something moves and the molecules are moving much faster than when they don't have kinetic energy) to help the solar oven. It will help the solar by letting the hot air cook the in and the cold out and the cookies, cook well. The solar powered oven need transfer of energy to be able to heat up the cookies and be able to make the cookies well. ( when energy moves from one place to another and it heats of colls something down)

We made the solar oven out of cardboard, aluminum and plastic wrap. First we made the cardboard look like a fridge. Then we cut the top part so that it can be where the sun is going to hit to allow the cookies to bake, we put plastic wrap all over it so that it will make the cookies bake. Next, we cut the bottom part so the solar oven will be stable and it won't fall down. When we had that done we then put aluminum all

over the inside of the oven so that the sun can be reflected to all the parts of the solar powered oven. Finally we tested the oven and in 2 min it was up to 27 degrees Celsius. We chose to do this design because we knew the solar power oven would be fun and challenging to us for that case we all decide to do the solar powered oven. Our design changed every time because sometimes the materials we had didn't allow us to do what we had planned in the first place. We had planned to make the oven a lot smaller than it normally is we got different materials which allowed us to make the solar oven a lot bigger than usual

To test our prototype we first opened the top then we put a chip in side and then we let it sit in front of the sun. We then were checking the solar oven every 30 seconds and then we would record the temperature in like 2 min the oven was heated up and it was up 27 degrees celsius. we were checking the temperature every 30 sec and saw what we need to improve. Our prototype worked pretty well it baked some gold fishes that we had first tried with some goldfishes \* and then we tried with some chips and the chips worked better than the goldfishes because we had the small prototype when tried with the goldfishes and when we tried with the chips we had the bigger prototype so the bigger oven worked way better smaller one. If we had more time we would probably try to make our invention better by putting some more small pies like put more aluminum on the doors or make more space on the inside.

\*NOTE: Students are referring to goldfish crackers not real goldfish.

## Complex Project: Building A Prototype Sample C2

My name is [REDACTED] my partners are [REDACTED]. My client is Cocina Del Sol: A Latin American, Eco-Friendly Food Truck Company. They are asking for a device to bake their specialty cookies; Spicy Mayan Chocolate Chip, using the power from the sun. The first paragraphs will be about how my project works. The second one is how my project is made. My second paragraph is about how my invention was made. My last paragraph is about how my group tested our invention.

Tinfoil conducts heat so it can heat up the temperature and oven also the tinfoil transfer of energy. Temperature is the average energy of the particles that make up an object and the average kinetic energy.

Our invention works by thermal energy from the sun the tinfoil conducts heat and the black paper absorbs the heat in or pizza box. The ti My group used these following materials:

1. Tin Foil
2. Plastic Rap
3. Pizza Box
4. Cookie Dough
5. Black Paper

We used these materials because

1. The tin foil can conduct the heat and make the temperature hot. I know this because one of my table group members watched a Bill Nye the Science Guy episode and saw Bill build an oven with foil to conduct the heat.
2. We used the plastic wrap because the light from the sun can shine through the wrap and let the foil conduct the heat.
3. We used the box to hold the dough and that was our oven.
4. The cookie dough was to prove if our oven works.
5. The black paper is used to absorb the heat from the sun and to heat us the box and the dough.

We got a bigger box because we can put more material in our invention and to conduct and heat up the dough faster than before. We tested our prototype by gathering our invention and laying the box in the sun. We measured the heat every minute and observed the cookie dough temperature too and recorded our data down.

First test data, smaller box, no black paper:

1:00 - 30 degrees celsius  
2:00 - 32 degrees celsius  
3:00 - 33 degrees celsius  
4:00 - 35 degrees celsius  
5:00 - 37 degrees celsius

Second test data, bigger box with black paper:

1:00 - 30 degrees celsius  
2:00 - 33 degrees celsius  
3:00 - 36 degrees celsius  
4:00 - 39 degrees celsius  
5:00 - 42 degrees celsius

Our invention and data was better and the evidence is above.

If we had more time, we would improve our invention by getting more tools like a light bulb inside when there is no sun, batteries to make the bulb work when there is no light from the sun, last but not least, make the box expand, not a big box.