Egg Incubator	
Purpose- ● Create an egg incubator for rural communities that don't get much or any electricity	Customers- ● People in rural areas ● People in communities that don't get electricity ● People who live on farms and have no access to electricity
Desired end result - Goals - ● To make an incubator without electricity ● To have the heat source last at least 2 hours at 100 degrees	Measures of Success- ● Success will be obtained when the temperature of the incubator stays at least 100 degrees for at least 2 hours ● can measure the temperature on the thermometer

Introduction

- The egg incubator includes hot water that reaches temperatures up to 104 degrees Fahrenheit after heating it, letting it cool would help it reach the goal temperature of 101 degrees Fahrenheit
- Many trial and errors have occurred until the current heat source was used
- The first idea was to get a hold of a lamp, in which, didn't work, and then tried to use small water bottles by painting them black and putting them in the sun, that didn't work either
- On the third try, using a 1 litre soda bottle, filled halfway with hot water, which in conclusion, worked, when baby blankets were added alongside it

Question/Problem and Predictions

- Many rural communities may not have access to electricity at its fullest extent

- Egg incubators may be vital for livestock and people in rural communities should have access to them

- The goal is to construct an incubator capable to incubate and nurture the eggs without using electricity

Materials needed

- Box
- Plastic sheets (3x)
- Bag of cotton balls
- Roll of metal mesh
- Insulated aluminum ziploc bags (4x)
- Baby blankets (4x)
- 1 litre plastic soda bottle
- Duct tape roll
- Hot glue
- thermometer

Step-by-Step process

1. Poke holes on the sides of the box (will ensure air flow)
2. Measure plastic sheet to fit the top of the box (3x)
3. Fold the sides of the sheet onto the sides of the box (3x)
4. Cut flaps halfway through to create an opening (3x)
5. Duct tape remaining flaps onto the side of the box creating a lid (3x)
6. Add a layer of cotton balls to the bottom of the box (interior)
7. Cover the cotton ball layer with the mesh (make sure to cut the mesh so it could fit in the box)
8. Glue aluminum bags to the sides of the box (interior) (2x)
9. Add another aluminum bag on top of the mesh layer
10. Microwave 2 cups of water for 4 minutes

Step-by-Step process continued

Transfer the water into the 1 litre soda bottle

12. Insert the soda bottle into the box
13. Surround the bottle with the blankets (4x)
14. Add another aluminum bag on top of the bottle and blankets
15. Top it off with the thermometer of top of the aluminum bag

note that where the thermometer lay, will be where the eggs nest

Pictures of the Original Idea

How the incubator looks when opened.

How the incubator looks when closed.

The inside of the old incubator design which is cotton balls.

Pictures of the Final Version

The new incubator design. This includes baby blankets and 1 litre soda bottle with hot water inside.

Final Temperatures

	Straight out of the microwave	10 min after being microwaved
5 min in the microwave	• 50 degrees celsius • 122 degrees fahrenheit	• 45 degrees celsius • 113 degrees fahrenheit
4 min in the microwave	• 40 degrees celsius • 104 degrees fahrenheit	• 39 degrees celsius • 102 degrees fahrenheit

The temperature on the thermometer was 50 degrees Celsius/122 degrees Fahrenheit. * the temperature was affected by the atmosphere of the classroom so it appears to be 36 Celsius not 50 Celsius.*

Observations

- Water bottles were exerting too much heat
- Thermos were too insulated and not exerting enough heat
- The soda bottles had both qualities that the water bottles and thermos had or lacked
- The warmth of the sun wasn't hot enough to warm the bottles but it was hot enough to warm up the sides of the box

Discussion and interpretation

- Based on the data that was collected, the device would last 30 minutes before it wouldn't be the goal temperature about 99-101 degrees Fahrenheit
- Since every ten minutes 1 degree Celsius went down and the temperature was 104 degrees, the project would in theory last 30 minutes before the temperature reached below the goal temperature
- Although the 50 minute period prevented from gathering more data, simple calculations were able to calculate the amount of time the heat would last
- The project was a fail originally, but manageable to the point where having a deeper understanding about the project and other ideas were simple to have
- Eventually, the project would last at least be successfully completed

The Limitations/Challenges

- The first heating source (the lamp) didn't work because it had to be charged with electricity, which had to change
- The second heating source (the painted water bottles) didn't work because it was too cold outside and it wasn't getting enough heat from the sun, which was a problem
- The third heating source (the thermos) was too insulated and wasn't exerting enough heat, it was a problem because we need heat
- It came to the final heating source (the 1 litre soda bottle) was the one that worked the best, it was also the solution to the heating problem
- Heating sources was the main challenge because the first three wouldn't work
- The 1 litre soda bottle, worked, but it wouldn't last very long (approximately 30 minutes), the idea just stuck with the incubator even though the group was aware of this.

Why This is Important

- This is important for people who live in rural areas or live in communities that lack electricity
- It is critical for those who need livestock such as chickens or want to raise other animals
- If this was ever used, provided instructions for supplies and how to build it would be there
- The heating source, if people won't be able to use a microwave, may be able to use the sun or boil water using fire
- The issue is that people don't have access to incubators which is critical because it is believed people who would like an incubator but lack electricity, should have what they desire

Ideas for Future Research

- Possibly for the future, obtain an actual heating lamp that doesn't require electricity and can use batteries for power in the future
- Turn away from using water and use hand warmers or other material
- Instead of using cotton balls, use a warmer material, like wool
- Discover other trusted websites to find more information to help construct our incubators if it would be used further

References

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