Research

Sawdust incubator: an alternative traditional hatchery technique for Japanese quails (Coturnix coturnix japonica):

In the incubator the eggs must have cushion, when using sawdust it is an alternative to heat. The sawdust provides cushion and brings up heat into the eggs and helps hatch the egg faster.

.https://poultry.extension.org/:

The chicks need 23-24 hours of sunlight per day after a couple days the chicks need less and less sunlight. If kept indoors give the eggs 8 hours a day, if kept outdoors they must be exposed to sunlight for a limited amount of sunlight.

https://cdn-de.agrilife.org/extension/departments/posc/posc-pu-018/publications/files/incubating-and-hatching-eggs.pdf

The temperature of the eggs are needed to be between 55 and 65 degrees fahrenheit in a storage, for instance a wooden coop the eggs will heat up towards 72 degrees fahrenheit. With imperfect standards for this, it will remain in a failed incubated egg. Eggs have to be covered with a thin cloth to remain clean and warmer from cold temperature.Use a little pan filled with hot water to heat the incubator. If the heat rate is even to 50% to 60% heat, it is enough to hatch the egg. The egg needs to be consistently monitored with heat for it to stay healthy.

https://forum.mysensors.org/topic/7427/egg-incubator-iot-v3-0

This site demonstrates how to use a cardboard box for the egg along with foam :to prevent heat loss from the egg. So if the egg is already heated at a great temperature then this would maintain that temperature for a long period of time.

/https://haywood.ces.ncsu.edu/setting-up-an-incubator/:

This site shows how to make the incubator out of simple materials. Using cardboard and plastic wrap. The incubator should be at 99.5 degrees to 101 degrees.

https://www.fao.org/4/y5169e/y5169e06.htm
This site explains the eggs need to be tested for fertility after one week by being held close to a candle or bright light. Food and water should always be close to the incubator and should be kept at a humidity between 75 and 80 percent.

Incubating and Hatching Eggs - Texas A&M AgriLife

This article recommends what days the eggs should be placed inside of the incubator going up to 7-10 days when laid. However, eggs that are laid and remain 3 days together, they must be separated due to the layout of the incubators.

https://extension.okstate.edu/fact-sheets/artificial-incubation.html
The chicken takes about 21 days to hatch. The temperature in the incubator is extremely important for the chick to hatch faster. As well as humanity in the incubator. Both of these elements are both needed to make a nice warm shelter for the chicks.

https://agclassroom.org/hatching-science/incubators/
This site explains what you need to do to make sure the eggs are at the right temperature and humidity. If you are planning to do the full 21 day hatch time, get a hygrometer, to measure the humidity, and the temperature stays a good temperature all day.

https://poultry.tamu.edu/wp-content/uploads/sites/14/2023/07/E-635-Hatching-Eggs-in-the-Classroom-A-Teachers-Guide.pdf:
The longer you store your eggs, the better the results will be. The eggs must be fertile to 55-69 degrees. Be sure to record your results throughout the 21 days

PROS/CONS

Idea #1

Materials,

- Shoe box
- Tin Foil
- Cotton Balls
- Solar Light Bulbs

The cardboard creates walls for all our supplies to stay in

Foil radiates heat back on to the eggs.

When using cotton balls they create a soft and warm insulator.

Using a non electric light bulb, by using solar panels on the side using the sun

PROS	CONS
• Good cushioning on the inside • Doesn't need tons of supplies • 2 good insulators to hold heat • Simple and easy	• Solar lights are not available to us • Needs a ton of sun • Solar lights can be expensive

Idea #2

Reinforced "insulation"

Items included:

- Cardboard
- Foam or sponge
- Cotton balls
- Tape or hot glue
- Possibly reflective glass
- Tin foil as 2nd option for instead of glass

PROS	CONS
• Cheap supplies • Good insulation like foil, glass, and cotton balls • Has second option in case the glass doesn't work	• Doesn't explain how to use materials • Reflective glass kind of expensive

Idea 1

- We can use a 1 foot by 1 foot box to put the eggs in
- We can get a hygrometer to measure the humidity and a thermometer for the temperature
- To consistently heat the incubator, we can use a heat lamp and in the meantime, cover the incubator in layers like a cloth or mini blanket to make sure the incubator is enclosed so all the heat stays in or a cardboard cover
- We can also use styrofoam to layer the incubator to insulate the incubator

PROS	CONS
• Will be able to maintain heat • Temperature is maintainable for the egg's heat to be accurate • Great insulation	• Heat lamp will need battery eventually • Watch the eggs constantly • May have to take off many of the heat maintainers(blanket, insulation)

Idea 2

1. **A cardboard box at least 1 foot long box to heat the eggs**
2. **Light bulb to be able to heat up the box up**
3. **Thenomontier should be heated up to at least 99 Fto 101F**

PROS	CONS
• Card board is good for keeping the heat nd transferring • Very little supplies	• Light bulb may not be available for us • Eventually the light bulb will run out of the internal component

Idea 3

- We can get a big plastic container or water bottle to put the eggs in
- You can poke hole in it to put the thermometer in it and then cover it with tape or cloth
- To heat it you can put warm cups of water to heat the incubator or use a heat amp
- To insulate it, cover and layer the container or bottle with

  Foam or mineral wool

PROS	CONS
•	• The warm water will eventually cool down and turn cold especially because of the cold conditions •

Idea #3

Materials

- Water Bottle
- Hay
- Tape
- Saran Wrap

PROS	CONS
• Egg comfortability • Egg can be transported to cold or warm areas as it is inside a water bottle	• Insulation is poor but still provides • Many little supplies

THE VISION

Prototype Design Materials

- 2 Cardboard boxes different sizes
- Tape
- Hotglue
- Sponge
- Foil
- Cotton Balls
- Hand Warmers
- Magnifying glass- maybe

Responsible for the following supplies:

- Cotton Balls: Target, $1.99, Walmart, $1.89
- Hand Warmer: Target, 13 pack, $9.69

Responsible for the following supplies:

- Magnifying glass: At home
- Sponge:At home

Responsible for the following supplies:

- Tape: Walmart $4.98

Responsible for the following supplies:

- Foil;:Dollar tree: $1.75
- 2 cardboard boxes: have at home

**Make sure to add approximate cost next to each supply item. Supplies due by Tuesday, January 20th.

January 20, 2026

On the first day, after all of our research, we cut four sponges in half so we could have more. Then, we cut the sides of both the big box and the small box. After that, cut tin foil to tape to the little box so the sun could reflect on it and heat it. Lastly, we glued the sponges on the floor of the box.

January 20, 26

1) Cut sides of the cardboard box
2) Cut four sponges in half
3) Cut tin foil 12 by four inches and taped it to the walls of the box
4) Hot glued sponges on floor of the box
5) Got hand warmers and taped them on the bottom and top

January 21, 2026

First, hot glue cotton balls on the floor next to the sponges. Then, get handwarmers and hot glue them to the little box to have a heat source. Glue them to the top and bottom of the box to ensure heat and that it doesn't escape. The temperature got to 75 degrees.

January 22, 2026

We got a magnifying glass to get more heat to get the temperature to at least to 90 degrees. We tried to build supports for the magnifying glass but it broke and it didn't work. The magnifying glass could cause a fire. We took off the handwarmers and put the new ones on

January 23, 2026

We only took off the old handwarmers and put in new ones.

January 26, 2026
We changed our whole idea because the temperature only got to 80 degrees and we were running out of handwarmers. We looked on our slides to see what idea would work. We are going to get a big water jug, a heat emitter, and fill little containers with boiling water for extra heat

Idea 3

- We can get a big plastic container or water bottle to put the eggs in
- You can poke hole in it to put the thermometer in it and then cover it with tape or cloth
- To heat it you can put warm cups of water to heat the incubator or use a heat amp
- To insulate it, cover and layer the container or bottle with

  Foam or mineral wool

January 27, 2026
We cut one hole in the water jug to put all the stuff in. We duct taped and put a little door on there. We put the light bulb in

January 28, 2026
We put the cotton balls in the jug on the bottom for insulation. We took pictures to document our idea. We put boiling water and handwarmers on for heat. The temperature finally got to 100 degrees.

January 29, 2026

We put sponges in there to soak up the humidity because the small containers with water were really humid. We also put them in there for insulation.

February 2, 2026

We tied the light bulb to the top of the water jug. We refilled the small containers with boiling water. We put new handwarmers in the water jug.

January 27-february 1

1) Box didn't produce heat and had to get rid of it
2) Got a big water jug
3) Cut a big hole to put cotton balls in
4) Got a lightbulb, hot water bottles, hand warmers, and songs to keep it humid and hot
5) Got it to 120 degrees

February 3, 2026

We tied the light bulb to the top of the water jug. We refilled the small containers with boiling water. We put new handwarmers in the water jug. The temperature got too hot at 120 degrees so we had to take a couple of handwarmers out to bring the temperature down to 100 degrees.

1

2

3

4

5

6

7

8

Goal Setting/Design Choice

We know our design will be successful when..

- When the temperature maintains the egg temperature and the inside.
- When there are signs of heat from the foil
- Insulation materials can hold together with glue/tape/hot glue
-

How our heat source will be maintained

The heat source will be maintained by the cotton balls replacing a nest like shape, the insulation will provide a good maintenance with the heat. The foil will also help with this because it will reflect some sunlight into the box.