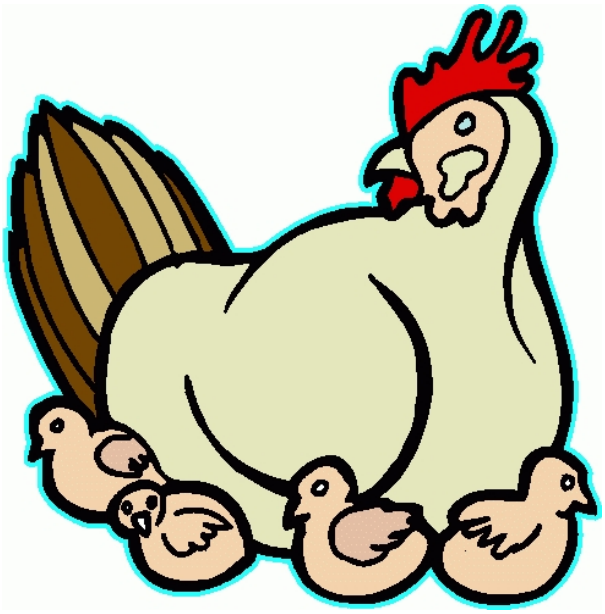
SO YOU'RE GOING TO HAVE A BABY .....

CHICK!!



Tips for Teachers and Others Embarking on the Embryology Experience

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Download at **http://xrl.us/embryology**

INTRODUCTION

Incubating eggs is a marvelous learning experience for children. Besides the biological information a student learns, there is a great opportunity to teach responsibility, planning, and consequences.

The successful incubation of eggs in a classroom requires planning on the teacher's part. Besides getting the incubator and eggs, you also have to set up the incubator correctly and plan how you'll take care of the eggs on weekends, so you'll have a successful hatch after class anticipation has built for three weeks.

There are several things that will help insure a successful incubation. Here are some tips that will help:

THE INCUBATOR

Temperature - An incubator must be able to maintain an air temperature of 100 degrees. The temperature may fall or rise a couple of degrees every once in a while, but the goal is to keep it at 100 degrees. Cooler temperatures will slow embryo growth, warmer temperatures will speed it up. Having the temperature fall to 90 degrees for 30 minutes is less harmful than having the temperature rise to 110 degrees for 5 minutes. If the temperature remains below 100 degrees, perhaps 96 degrees, for several days, the hatch will be delayed by as much as a day and some chicks may not survive. If the temperature stays at 102 degrees for several days the hatch will be as much as a day early and chicks may be mal-formed.

Test the incubator for at least two days before putting eggs inside. Don't use just any old thermometer. Some inexpensive glass thermometers are as much as 10 degrees off from an accurate reading. Get an oral fever thermometer and compare readings with the thermometer you intend to use in the incubator. (Oral thermometers should not be used during the incubation, because they only register a maximum temperature; they do not fall if the temperature falls.) Put both thermometers alongside each other in a glass of warm water to check that your incubator thermometer registers 100 degrees correctly.

Indoor/outdoor digital thermometers are inexpensive and easy to use. However, despite their “digital” name they can still be inaccurate. **HINT**: Get a “snack cup” of rice pudding, warm it up, insert the probe of the indoor/outdoor digital thermometer and place it in the incubator. In this way you can easily monitor the internal temperature of the eggs. I have had no problems leaving the probe of the digital thermometer in the pudding cup for the entire incubation.

The best place for an incubator is in a room where the temperature does not fall at night. Check with your school custodian/principal to understand how thermostats for the school are set. It can be a problem to keep the incubator warm enough if school temperatures fluctuate more than 10 degrees daily.

Suggestion: As you test the incubator before the eggs arrive, try putting it in a large cardboard box with crumpled newspaper around it to minimize heat loss. Use a "Maximum/Minimum thermometer" to determine how much room temperature varies at night. This is a great science/math experiment for your students to monitor.

If your incubator has an adjustable thermostat, be sure you know how much adjustment it takes to raise or lower the temperature one degree. Remember: the air temperature around the eggs will fluctuate much more readily that the internal temperature of the eggs.

Don't worry if the temperature falls a few degrees right after you introduce the eggs. It may take 6 hours for the cool eggs to reach the correct temperature.

Note: The temperature in the incubator will rise a few degrees around day 14 or 15. You'll have to adjust the thermostat accordingly. This is a result of the chicks in the eggs beginning to make body heat of their own.

Humidity - Eggs must have a higher humidity in their environment than is normally present in a classroom. Most incubators take care of this by having a pan of water or a wet sponge inside. If your incubator has a humidity indicator (a "wet bulb thermometer"), it should register 83 degrees when your other, dry bulb, thermometer registers 100 degrees for days 1 - 18 (60% humidity). On day 19 increase the humidity, by increasing the size of the saucer or sponge, so the wet bulb thermometer reads 88 degrees (65% - 75% humidity). I have had good success measuring humidity with a Madeline brand cigar humidor hygrometer (available online). It is digital and adjustable.

Avoid opening the incubator after the 18th day. High humidity softens the shell and inner membranes so the chick can peck through. Opening the incubator lets all of the moisture out and shells harden once again. Use a flashlight to observe the hatching process through the incubator observation window. Don't let humidity escape.

Turning the Eggs - Incubating eggs must be turned regularly to keep the embryo from staying in one spot all of the time. Eggs should be turned an odd number of times each day so that the embryo does not stay in the same spot several hours each night. In a classroom, eggs can be turned when school begins, at lunch, and when school ends.

Mark the eggs with an "X" on one side and an "O" on the other. This allows you to see when you've turned all the eggs. Situate eggs so the large end of each is higher than the small end.

The necessity of turning the eggs regularly means that the eggs have to be taken home on the weekend or other arrangements made. If you have to take the eggs home, this should be done in less than an hour after you unplug the incubator. Eggs can be padded with crumpled newspaper or a blanket or put into an egg carton inside the incubator. When you plug in the incubator at home, be sure the temperature rises to 100 degrees again after a couple of hours. A room with different conditions from the classroom may necessitate thermostat adjustment.

Short cut: get a foam egg carton and cut off the lid. Punch LOTS of pencil-sized holes in the egg cavities and in the removed lid. Remove a half-inch wide strip around the perimeter of the foam lid. Place your eggs in the carton and place the lid on top. Use three rubber bands to secure the lid to the egg container. Place a piece of wood 2" x 2" x 10" in the incubator. Prop the carton lengthwise/sideways on the wood block. When it's time to turn the eggs, tilt the carton up onto its other side using the wood block to prop it up once again.

For a bit more money: Automatic egg turners are available (see Resources below). Used ones can be purchased on Craigslist or EBay.

IMPORTANT:
Stop turning the eggs on day 18. At this stage, the embryo is getting into position to hatch and should not be turned again. Many hobbyists simply put the eggs large-end-up in an egg carton for the last three days. In this way the chicks can hatch and heave themselves out and away before they interfere with other eggs that are hatching.

Candling - It is important to be able to see if the embryo is developing inside the egg. You can do this by constructing a simple "candler". See the leaflet "Building a Candler" at www.walterreeves.com for more information. Check on embryo progress on Day 7...you should see blood vessels inside the shell. The inside will have a reddish hue. Discard any eggs that have not started developing by this point. Dark shelled eggs will be hard to see inside after day 7.

Timing the Hatch - Chickens take 21 days for the embryo to develop and hatch. Other birds have different incubation times: ducks - 28 days, turkeys - 28 days, bobwhite quail - 23 days. If you are incubating chicken eggs, Tuesday is a good day to start the eggs. This means the chicks will hatch on a Wednesday, three weeks later. Since Wednesday is in the middle of the week, this allows for a variation of a day or two.

THE HATCH

If all has gone well, on day 20 you may hear faint "cheeps" from your eggs. Sometimes they will respond to a low whistle on your part. In a quiet room you may hear the first taps on the inside of the shell.

The process of hatching takes 3 - 8 hours. The chick will tap a hole in the shell, expand the crack around the shell, struggle to get out, and then dry out and learn to walk. Chicks need the struggle to emerge, in order to strengthen their muscles, lungs, and heart. It is usually best not to help the chicks. They will often stop to rest and pant for several minutes -- this doesn't mean they've quit. As long as they are breathing, they are OK.

You might help by removing attached bits of shell when the chick is completely out, or snipping the chick's umbilical cord if it remains attached to the dried up yolk sack, but do this only as a last resort. If the chick is in the egg and seems to be struggling to peck through the shell after several hours, carefully remove a few pieces of cracked shell around the initial “pecked hole”. If you decide to cut the inner shell membrane, be extremely careful. Make a minimal cut with “baby-size” fingernail scissors. The last egg to hatch may have problems because you opened the incubator a couple of times to remove the “early birds”. This releases humidity and causes the shell and membranes to toughen. If you can see that the membrane looks tough and leathery, use fingernail scissors, as described above, to help a bit.

Remember - the struggle to hatch is important.

When some of the chicks are squirming around learning to walk, they may interfere with the slower-hatching chicks. Consider moving the "walkers" to a brooder box once each day. Truthfully, the loud squeaks from the first chicks to emerge help stimulate the efforts of the laggards. One way to keep the walkers/squirmers from lunging around too much is to make sturdy, three inch tall, five inch diameter, circular “corrals” out of manilla folders and put one around each egg on day 18.

It is normal for a newly emerged chick to take long rest breaks, stretched out and barely breathing, as they learn to walk. The process of drying their initially wet feathers and learning to walk can take 10 hours. Do not handle them, let them dry on their own.

NOTE: If you choose to hatch eggs in your classroom, do not plan on getting ANYTHING accomplished that day. There will be too much “cheeping” from the incubator and your students will not be able to restrain themselves.

For a preview of the hatching process, there are plenty of “Chick Hatching” videos on **YouTube**.

Suggestion: Put the incubator in an empty room and let the students visit it for ten minutes at the end of each hour. The process of hatching is so lengthy you won’t miss anything between visits. Even so, no teacher, parent or principal will be able to resist checking on progress whenever they pass by the hatching room.

THE BROODER BOX

Chicks must be kept warm after they hatch. This is best done in a medium-sized box with a 60 watt bulb in an aluminum (not plastic!) reflector hung four inches off the floor at one end. Cover the open end of the reflector with aluminum foil so heat is transmitted but not much light. A box 18 inches high, 24 inches wide, and 24 inches long is great for up to 12 chicks. (Smaller boxes than this tend to overheat.) The top should be loosely closed and there should be a few 1/4" holes near the bottom of the box for ventilation. Before the chicks arrive, get a piece of window glass or Plexiglas and cut a large square/rectangular hole in the side of the box. Make the hole 1/4" smaller than the glass on all sides. Tape the glass onto the box with duct tape. Students will be able to observe the chicks without opening the brooder. Hang the probe of an indoor/outdoor thermometer in the box at chick level to monitor temperatures.

The chicks will position themselves in the box where they are most comfortable. There should be an area where the temperature is around 95 degrees, which is where the chicks will want to be. If they cluster near the bulb, the box is too cold. If they spread out far away from the bulb, the box is too warm. Don't let the brooder get too hot - watch the chicks' behavior.

Make sure the brooder box is fully warmed-up before transferring chicks to it.

Place water and feed in the corner of the box. The chicks will likely discover it on their own but you can always take them to water and dip their beaks in it to help the process along.

Chicks signal their discomfort with loud, repeated cheeps, much as an unhappy human baby shrieks inconsolably sometimes. When they are happy, chicks make small chirps among themselves.

A few sheets of paper towel on the floor of the box is fine for the chicks to walk on. Paper towel is much better than newspaper because they can get a grip on it with their toes. They do not need wood shavings initially. After a few days, when all are walking without problems, cover the floor with a quarter-inch layer of pine or aspen shavings (available at pet stores). Do not use cedar shavings.

FEEDING AND WATERING

Water can be put in a shallow saucer with an overturned tea glass in the center, leaving a ½" rim of water exposed. This keeps the chicks from climbing into the center of the saucer and getting wet. Put a few half-inch diameter balls of shiny aluminum foil in the water to attract the birds. Once they are initially walking around, dip each chick's beak into the water to help them learn "what water is". Some experts recommend mixing 4 teaspoons of sugar in a quart of water to offer new chicks for the first day, followed by plain water in the waterer afterward.

Chicks really don't need to eat for 24 hours after they hatch so don't panic if you don't have any feed, but they do need water. Mashed, hardcooked egg makes an excellent starter feed. Regular corn meal is OK (but not self-rising) . A small pile of feed can be put in a jar lid - the chicks will soon find it. Hot glue the lid in the center of a thin 6" x 6" piece of plastic or cardboard to keep the biddies from standing on the lid and flipping it over.

You'll need "normal" chicken starter feed (available at "feed & seed" stores) after the first few days. If it seems too coarse for the chicks at first, put it in a blender to make it as fine as corn meal.

Decrease the brooder temperature 5 degrees every week after hatching: 7 days after hatch reduce to 90 degrees, 14 days after hatch reduce to 85 degrees, and so forth. Again, watch the chicks' behavior. They will demonstrate if they are too hot or too cold.

PROBLEMS

You'll have them. Aesop's admonition to **avoid enumerating one's young fowl before birth** is absolutely true! Some of the eggs won't hatch or ALL of the eggs won't hatch. One of the chicks will die as it hatches or one will be deformed. Keep your students informed of this possibility throughout the incubation period. Even an experienced hen won't have 100% of her eggs hatch.

Fortunately, problems can be used to teach, too!

If the eggs don't hatch as expected, give them a day or two in the incubator - sometimes there is a lot of variation in the age of the fertile eggs you get and the embryos may not finish developing when you expect them to.

If they still don't hatch by Day 24 and you can detect no signs of life, the cause is probably hopeless. In this case you can decide whether to simply dispose of the eggs or to open them to see what happened.

Eggs can be opened into a saucer and the embryo examined. Decide beforehand if you want your students to witness this. There will rarely be any blood...with proper discussion beforehand, most students can understand what is going on. Open the egg into a saucer of warm water and gently wash the fluids and membranes from the body. Discuss the membranes, the large eyes, the feathers (if any) and the egg tooth on the chick's beak as you work. Your students will be fascinated!

If the embryo is not very developed, there was probably a problem with the temperature in the incubator. If it is fully developed, the problem was probably incorrect humidity.

These websites have good photos of normal and abnormal embryo's:

Analysis of Poor Hatches
http://animalscience.ucdavis.edu/Avian/pfs32.htm

Stages of Chicken Embryo Development
http://msucares.com/poultry/reproductions/poultry_chicks_embryo.html

The embryo can be preserved in a 1:1 mixture of water and ethyl rubbing alcohol in a clear glass baby food/jelly jar. (For teachers who remember their mis-spent youth, straight 150 proof Everclear grain alcohol works well as a preservative.)

AFTER THE HATCH

Once the excitement of hatching has passed, what will you do with the chicks? They grow fast...and pretty soon they will have small wing feathers and will constantly try to jump out of their box. In addition, someone (probably **YOU**) will have to make sure the brooder is cleaned each day and water/feed added.

Have you determined who will care for the chicks on the weekend?

Your students will want to handle the birds. Are they old enough to do this safely? Do you have a dispenser of hand sanitizer nearby?

Plan on keeping the chicks at school no more than two weeks. They become too messy and too much of a distraction otherwise.

One way to find the chicks an appropriate home is to advertise on Craigslist. Many urban and suburban homeowners have chickens for entertainment and eggs and they will be happy to take the babies off your hands.

SOURCES OF EGGS, INCUBATORS and INFORMATION

Fertile eggs:

Fertile eggs come from farms where roosters are kept with the hens. Eggs collected from such hens should not be refrigerated or washed. They can be saved in a cool (not cold) place for up to five days after being laid before being placed in an incubator.

Georgia Farmers and Consumers Market Bulletin		www.agr.state.ga.us/mbads
Stromberg's	800-720-1134	www.strombergschickens.com
Murray McMurray	800.456.3280	www.mcmurrayhatchery.com
EBay		www.ebay.com

(I have ordered hatching eggs three times from Crazy K Farm (www.crazykfarm.com) and have had great results.)

Incubators and Parts:

Build your own http://www.walterreeves.com/uploads/pdf/incubatorplans.pdf

Locally, Standard Feed and Seed (404-241-6922) sells incubators.

GQF Manufacturing		www.gqfmfg.com
NASCO Scientific	800-558-9595	www.enasco.com
Carolina Biological	800-334-5551	www.carolina.com

FURTHER REFERENCES

How Eggs Are Made
http://www.walterreeves.com/insects-and-animals/eggs-how-they-are-made/

North Carolina State: Embryology
http://www.ces.ncsu.edu/depts/poulsci/4h/embryology/embryology.html

National 4-H Embryology Project
http://4hembryology.psu.edu/teacherresourcen.html

Incubation and Embryology
http://urbanext.illinois.edu/eggs/res00-index.html

Texas A&M Hatching Guide
http://gallus.tamu.edu/library/extpublications/b6092.pdf

BackYard Chickens online forum
http://www.backyardchickens.com/forum/index.php

Yuku Back Yard Chickens discussion site
http://www.backyardchickens.yuku.com/directory

Chicken Crossing
http://chickencrossing.org/

The Chicken Whisperer (local chicken expert available for lectures)
http://www.chickenwhisperer.net/