

This is a multi-day lesson

NOTE: THIS PROJECT REQUIRES LIVE CHICKS AND THE CHICKS WILL NEED TO BE HOUSED AND FED FOR SIX WEEKS. CHICKS CAN BE OBTAINED IN THE SPRING FROM ANY FEED STORE (TRACTOR SUPPLY ALSO CARRIES THEM). YOU CAN ALSO CONTACT YOUR COUNTY EXTENSION AGENT TO SEE IF THEY HAVE CHICKS AVAILABLE.

All the same species in a classroom is not necessary as long as each group of students have all the same species in their control and experimental groups.
Arkansas NGSS Standards Suggestions:



Integrated Biology:

BI-LS1-6: Construct and revise an explanation based on evidence for how carbon, hydrogen and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.

Science and Engineering Practices: Planning and Carrying Out Investigations (BI-LS1-3).
Constructing Explanations and Designing Solutions (BI-LS1-6)

Crosscutting Concepts: Structure and Function ((BI-LS1-1). Energy and Matter (BI-LS1-6).

Disciplinary Core Ideas: LS1.A: Structure and Function (BI-LS1-2). LS1.C: Organization for Matter and Energy Flow in Organisms (BI-LS1-6)

Arkansas Disciplinary Literacy Standards: WHST.9-12.2, WHST.9-12.5, WHST.9-12.

Arkansas English Language Arts Standards: SL.11-12.5

BI3-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability and aesthetics as well as possible social, cultural and environmental impacts.

Science and Engineering Practices: Using Mathematics and Computational Thinking (BI-LS2-2).
Constructing Explanations and Designing Solutions (BI3-ETS1-3). Engaging in Argument from Evidence (BI-LS2-8).



Crosscutting Concepts: Cause and Effect (BI-LS2-8, BI-LS4-6), Scale, Proportion and Quantity (BI-LS2-1), Systems and System Models (BI3-ETS1-4), Influence of Science, Engineering and Technology on Society and the Natural World (BI3-ETS1-3).

Disciplinary Core Ideas: ETS1.B: Developing Possible Solutions (BI-ETS1-3)

Arkansas Disciplinary Literacy Standards: RST.11-12.7, RST.11-12.8, WHST.9-12.2, WHST.9-12.7.

Arkansas Mathematics Standards: MP.2, MP.4, HSN.Q.A.1-3, HSS.ID.A.1

Objective: The students will determine by research and then experimentation whether or not soy or non-soy based feeds (or other options) are better for chicken growth.

Assessment: Students in a group will do a presentation of their findings, including cost, overall rate of change and price per gram/cm of growth of the chickens.

Key Points: Structure and function, somatic reproduction of cells, nutrition, economic impact.

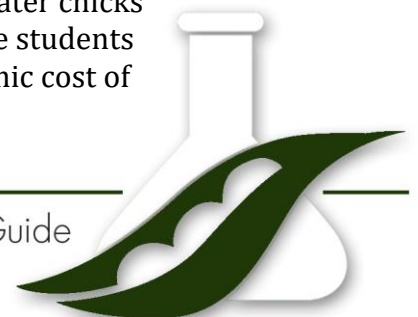
Preparation: Students will need to find two large cardboard boxes or chicken wire for their chicks' cages. Chicks should be bought the day before the experiment begins. Any small low sided plastic container can be used for chicks' food and water.

Time Durations: Assume six weeks for this experiment. Students will need to do daily measurement/husbandry checks on the chicks so depending on chick location, anticipate about 15 minutes a day for this. Other options are conducting these measures before or after school or during lunch to save time in the classroom.

Elicit: Ask what the class thinks of when you say the word 'chicken'. Most likely you will get comments such as 'food, bird, eggs, etc.'. Then ask, 'what do you think commercial chickens are fed to grow to the point of being ready for the market or egg laying?' Break the students into groups and have them brainstorm what is fed to chickens in a commercial setting to grow them for market. Make a list of the answers for the class to see.

Engage: Show the video <https://www.youtube.com/watch?v=os6Q5cSby3k> (What to feed chickens) to get students engaged in the project.

2 Explore: There is a lot of discussion about what feed is better for chickens than others, so the students' jobs are to determine if one type of feed (soy-based) is better than another type of feed (non-soy based). This will require each group to feed and water chicks for six weeks. After weighing and measuring the chicks for six weeks, the students will present their findings in a presentation format including the economic cost of the feeds per gram/cm of chicken.



Explain: Chicken is one of the cheapest meat proteins a person can eat. Discuss how meat is a complete protein, supplying all the essential amino acids the body needs to maintain life and grow. Getting a chick to the point of being in a Popeye's or Kentucky Fried Chicken meal takes a lot of science and math.

Have the students make a list of what type of nutrition a chicken would need to grow, and put this list where everyone can add to it. Chickens, like people, have certain nutritional requirements that need to be met to grow healthy and strong. Like us, they need proteins, fats, carbohydrates, vitamins and minerals. However, in order to make a profit, those chickens need to be reasonably enough priced to sell with costs low enough for the farmer to make money.

Many chicken feeds use soy as their protein source because it is inexpensive and a complete protein. There are other options though, but are they better? Do those protein sources grow a better chicken within a cost that allows the farmer to make a living?

Elaborate: Break the students into groups and, based on what was seen on the video and what was just covered, have the students do literary research on poultry feed and come up with a research question, hypothesis and plan. Students should do research on what feed will best fit their plan scenario. Students should for the most part figure out it is easiest if they feed one set soy-based feed and another set non-soy based feed, but if they come up with something more elaborate or different (and it fits the overall scope of the lesson) then you can decide if they can do it. Students should include weight and measurement of chicks daily to determine which chicks are growing faster.

Website Research Options:

<https://www.nationalchickencouncil.org/about-the-industry/history/>

<http://americanhistory.si.edu/blog/chickens-eggs-and-changing-american-diet>

<https://www.uaex.uada.edu/farm-ranch/animals-forages/poultry/>

<https://www.uaex.uada.edu/publications/pdf/FSA-8002.pdf>

<https://www.backyardchickencoops.com.au/all-the-different-types-of-chicken-feed-explained>



The Experiment:

Materials:

- **At least six (6) chicks per group.** Three for the soy-based feed and three for the non-soy feed.
- **Housing for the chickens:** use large cardboard boxes, or temporary pens can be made with chicken wire. Chicks need to be kept warm so they will need a heat source. Pens need to be cleaned two to three times a week. Paper works well as a bedding option. Chicks can be inside or outside (protected from predators) as long as there is a heat source.
- **Feed:** the chicks will need to be in separate housing, soy vs non-soy. Chicks get the same brand of feed the whole six weeks. Leave feed in pens at all times and change feed out daily. Consider contacting your local County Extension Agent for access to feed.
- A watering dish. Chicks need to have fresh water daily.
- A measuring tape
- An electronic scale or triple-beam balance
- A way to take photos of the growing chicks two to three times a week
- Notebook for measurement and feed notes with writing utensil

NOTE: Chicks need to be weighed at the same time every day in order to be consistent.

Methods:

Students should come up with their own methods of how they want to determine chick growth but generally they should measure weight and body circumference daily to determine overall growth. Students should also take pictures of the growing chicks to see how they are reacting physically to the chick feeds.

Evaluate:

After six weeks, students should do a presentation with introduction, research question and hypothesis, methods, materials, and tables and graphs based on chicken growth of the soy-based versus non-soy based chicken feed, etc. It is important that the students ALSO do a graph on cost per gram/cm of growth to determine which feed is the most cost effective for chicken growth. If it is easier for the students, they can do two separate graphs of the gram per growth and cm circumference per growth. Students should also include a results and conclusion section at the end of the presentation plus any references they used.

Evaluation is based on how well the presentation is written and presented and on the conclusion of the students. Suggest having students debate their decision for the best feed for chicken growth and cost effectiveness; if they can successfully argue why a certain feed should be used based on their research, then that shows they understand the concept. Another point to focus on is how do the chickens look? Are they

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healthy or do they look sick? Would a consumer want to buy a chicken that may be cheaper but is not of good quality? All these points should be noted and discussed in the presentation.

Extend:

Have students do a round robin where each group defends their decision as to the type of feed they would use to grow the best chickens. Remember that 'best' could mean best price, best looking, etc. The group's job is to convince the other groups why their decision is best.



Take a field trip to a local chicken farm and have the farmer explain how he/she raises chickens for market.

Have students put together a chicken meal including cost analysis and serve it to the class!

