Chick FEED Lay

3D-Student Science Performance

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Grade: 9-12; Integrated Biology/Agricultural Science

Lesson Topics:

Structure and Function
Somatic Cell Reproduction
Nutrition
Modeling
Economic Impact
Evaluating Solutions
Analyzing Global Challenges

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.

Performance Expectations (Standard) from State Standards or NGSS:

- **Students will understand that nutrition is tied directly into cell reproduction, structure and function.**
- **Students will use modeling based on experimentation to show whether or not commercial feeds are nutritionally different based on chick growth.**
- **Students will determine the economic impact of feed alternatives vs standard.**
- **Students will understand the cost versus growth of chickens on commercial chicken farms.**

Lesson Performance Expectations:

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- **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. [Clarification Statement: Emphasis is on using evidence from models and simulations to support explanations.][Assessment Boundary: Assessment does not include the details of the specific chemical reactions or identification of macromolecules.]

Connections to the Arkansas Disciplinary Literacy Standards:

WHST.9-12.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

WHST.9-12.5: Develop and strengthen writing as needed by planning, revising, editing, rewriting or trying an approach, focusing on addressing what is most significant for a specific purpose and audience.

WHST.9-12.7: Conduct short as well as more sustained research projects to answer a question (including a student generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Connections to the Arkansas English Language Arts Standards:

SL.11-12.5: Make a strategic use of digital media (e.g., textual, graphical, auditory, visual and interactive elements) in presentations to enhance understanding of findings, reasoning and evidence, and add interest.

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. [AR Clarification Statement: Problems could include effect of logging on animal or human populations, response to invasive species, agricultural practices, creating dams, and maintaining fish populations in public lakes.]

Connections to the Arkansas Disciplinary Literacy Standards:

RST.11-12.7: Integrate and evaluate multiple sources of information presented in diverse formats and media (examples: quantitative data, video, multimedia) in order to address a question or solve a problem.

RST.11-12.8: Evaluate the hypothesis, data, analysis, and conclusions in a science or technical text, verifying data when possible and corroborating or challenging conclusions with other sources of information.

WHST.9-12.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

WHST.9-12.7: Conduct short as well as more sustained research projects to answer a question (including a student generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Connections to the Arkansas Mathematical Standards:

MP.2: Reason abstractly and quantitatively.

MP.4: Model with mathematics.

HSN.Q.A.1: Use units as a way to understand problems and to guide the solution of multi-step problems, choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

HSN.Q.A.2: Define appropriate quantities for the purpose of descriptive modeling.

HSN.Q.A.3: Choose a level of accuracy appropriate to limitation on measurement when reporting quantities.

HSS.ID.A.1: Represent data with plots on a real number line.

Student Science Performance

Phenomenon: **Chicken meat is a viable protein resource for humans and chickens need nutrition to grow and be healthy in order fill that resource. Students will determine if different types of feed-based nutrition effect chicken growth and health and if there are economically feasible feed alternatives in a commercial chicken farm setting.**

Gather *(In this section students will generally be asking questions, obtaining information, planning and carrying out an investigation, using mathematical and computational thinking, or using models to gather and organize data and/or information.)*

1. Students obtain information in a literary search on chicken growth requirements and feed nutritional analysis and the economics of such feed.
2. Students plan and carry out an investigation to answer the question as to whether or not chicken feed made up of different base ingredients affects chick growth and health.
3. Students obtain information on how chicks respond to different feeds by implementing an experiment involving at least two different types of feeds and then monitoring chick growth and health for six weeks.

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

Reason *(In this section students are generally: evaluating information, analyzing data, using mathematical/computational thinking, constructing explanations, developing arguments, and/or using models to reason, predict, and develop evidence.)*

4. Students construct an explanation as to which feed is advantageous over another feed in chicken health and growth.
5. Students develop an argument using evidence that supports the explanation (claim) that one type of feed is more advantageous over another type of feed for chicken heath and growth.
6. Students, in groups, develop a model that shows how chicken feed is directly related to chicken growth, health and development. Students will also show the impact their tested feed will have on poultry production and costs.

Class Discussion:

Questions to initiate Discussion:

Q: What do you think of when I say 'chicken'.

Q: what do you think chickens need to grow? What type of nutrition is needed?

Q: What do you think commercial chicken are fed to grow to the point of being ready for market or egg laying?

Q: Do you think cost can be a factor in the choosing of chicken feed for poultry?

(Teaching Suggestions: In this section provide insights into the focus of the class discussion. The questions are typically how, why, or what causes. This is a good place to prompt with crosscutting concepts.)

Break the students into groups and, based on what was seen on the video and what was

just covered, have the students 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 feed and another set non-soy 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.

Communicate *(In this section students will be communicating information, communicating arguments (written and oral for how their evidence supports or refutes an explanation, and using models to communicate their reasoning and make their thinking visible.)*

1. Students groups use their research and experimentation model to present an argument for which chicken feed they tested showed the best in growth and development of chickens at the best price.

Teaching Suggestions: After six weeks, students should do a presentation with introduction, research question and hypothesis, methods, materials, tables and graphs based on chicken growth of the soy-based versus non-soy-based chicken feed (or other options). 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.

Formative Assessment for Student Learning

Elicit Evidence of Learning: *This box is the individual communication performance from the student prompts in appendix A*

Evidence of Student Proficiency

- *Students will understand that nutrition is tied directly into cell reproduction, structure and function.*

- *Students will use modeling based on experimentation to show whether or not commercial feeds are nutritionally different based on chick growth.*
- *Students will determine the economic impact of feed alternatives vs standard.*
- *Students will understand the cost versus growth of chickens on commercial chicken farms.*
- *Students will successfully defend their decision on chicken feed to the class.*

Range of Typical Student Responses

This section provides a range of typical student responses, often using a three-point scale.

Descriptors of grade-level appropriate student responses:

- *Full understanding: student presentations will show students understand the relationship of feed/nutrition to cell growth and reproduction in chickens, that not all feeds are the same. Different feeds can have different effects on chickens and different economic impacts on poultry producers. Presentations will cover all major points in a research project.*
- *Partial understanding: Student presentations will show students understand that chickens need to eat to grow but may not demonstrate how the feeds are different. Students show overall price difference but do not break it down into cost per cm or gram. Presentations may not have all necessary research project parts.*

Limited understanding: Student presentations will show students understand that chickens need to eat to grow but do not explain feed differences either experimentally or economically. Presentations are lacking key elements of research project.

Acting on Evidence of Learning

This is a brief description of the instructional actions to take based on the student performance. When the action includes extensive descriptors and/or materials you may wish use ***Appendix C.***

Description of instruction action and response to support student learning.

- *Action for student who displays partial or limited understanding: Student will be placed in heterogeneous groups with the teacher doing oral assessment feedback with that student throughout the project. If student is still struggling after project, student will be paired with a student mentor of full understanding to re-explain project data.*

- *Extensions of learning for student who displays full understanding: 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!

Science Practices:

Planning and Carrying out Investigations.

Constructing Explanations and Designing Solutions.

Science Essentials:

Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data.

Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.

Crosscutting Concepts:

Cause and Effect

Scale, Proportion and Quantity

Systems and System Models

Influence of Science, Engineering and Technology on Society and the Natural World.

Science Essentials:

Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

The significance of a phenomena is dependent on the scale, proportion and quantity as to which it occurs.

Models can be used to simulate systems and interactions-including energy, matter and information flows-within and between systems and different scales.

New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology.

Disciplinary Core Ideas:

LS1.A: Structure and Function

LS1.C: Organization for Matter and Energy Flow in Organisms.

ETS1.B: Developing Possible Solutions

Science Essentials:

Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage or discourage what is going on inside a living system. (BI-LS1-3)

As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products. (BI-LS1-6)

When evaluating solutions, it is important to take into account a range of constraints including cost, safety, reliability and aesthetics to consider social, cultural and environmental impacts. (BI3-ETS1-3, BI-LS2-7, BI-LS4-6)

Appendices: This section contains the lesson performance that students will see during the lesson and any other resources students will use to engage in the science performances. The appendices may also contain examples of student work.

Appendix A - Student Prompts

Phenomenon: Chicken meat is a viable protein resource for humans and chickens need nutrition to grow and be healthy in order fill that resource. Students will determine if different types of feed base nutrition affect chicken growth and health and if there are economically feasible feed alternatives in a commercial chicken farm setting.

Group Performances:

Ask questions to plan an investigation: 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.

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, 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?

Plan an investigation: Break the students into groups and, based on what was seen on the video and what was just covered, have the students 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 feed and another set non-soy 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.

1. Construct an explanation: Students should decide on a hypothesis based on chicken growth of the soy based versus non-so- based chicken feed (or other options) including economic impact.
2. Use experimentation to: show if one feed is better over another type of chicken feed both nutritionally and economically.

3. Use a model to: defend their position of which (if any) chicken feed is better to use over the other.

Class Discussion

Individual Performances:

4. Develop an argument for how the evidence the student collected over the six-week experimentation either supported or refuted their hypothesis about the best chicken feed to feed chickens bound for the commercial market.

The student prompt can be used to engage students in science performances and typically have 3-5 group performances and one individual performance. The individual performance typically lies within the communicate reasoning part of the sequence and often serves as a formal formative assessment. Often teachers add opportunities for class discussion into the instructional sequence to discuss things like "Good Questions to Find Resources" or "Class Debate" or "Discussion of Science Language Student Should Use".

Appendix B –

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.

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 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 chick 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 to conduct these measures before or after school or during lunch to save time in the classroom.

The Experiment:

Materials:

- **At least six (6) chicks per group.** Three for the soy-based feed and three for the non-soy feed (or other options).
- **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, etc. 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 tool.
- 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 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.

Appendix C *- This is a good place to put descriptions and resources for "acting on evidence of learning" from the Formative "Assessment for Student Learning". Typically, this is an additional reading with class discussion questions or other resource students use to meet the learning expectation.*

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

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