Creating & Evaluating Steaks

ANIMAL SCIENCE ANYWHERE

Skill Level:
▶ Beginner to advanced

Life Skills:
▶ Communication, cooperation, creativity, critical thinking, problem-solving, decision-making and teamwork

Setting:
▶ A room with at least one table and work space for four or more teams (depending on the size of your group)

Time:
▶ 20–30 minutes

Materials:
❏ 2 or 3 ounces of red modeling clay (such as Play-Doh) per team
❏ 2 or 3 ounces of white modeling clay per team
❏ One copy of the "T-Bone Steak Packaged for Retail Sale" photo
❏ "Meat Science" resource sheet (one per participant)
❏ Pen or pencil (one per participant)
❏ Scratch paper for each participant
❏ Toothpicks (four per group)
❏ Coffee stirrers (four per group)
❏ Scissors (one per group)
❏ Plates (two per group)
❏ Labels numbered one through four
❏ Clock or stopwatch

Overview:
The *Sculpting Meat Science – Creating and Evaluating Steaks* lesson is designed to help young people learn about the important factors associated with selecting meat. In the interactive lesson, participants will work in small groups to create a modeling clay steak to use in a model meat judging contest. They'll also learn the factors to consider when selecting meat products, and the importance of marbling and leanness in meat animal projects.

Objectives:
After completing this activity, participants will be able to:
▶ Think creatively to design a product with limited materials.
▶ Identify the importance of quality and cutability in meat.
▶ Prioritize the factors associated with selecting retail cuts, wholesale cuts and carcasses, while comparing the importance of these factors across species.

PROCEDURE:

Before the meeting:
1. Read the activity instructions and gather the supplies you will need.

2. Make one copy of the "Meat Science" resource sheet for each participant. Print as large a copy of the "T-bone Steak Packaged for Retail Sale" photo as possible.

3. Separate both colors of modeling clay into roughly equal amounts for each team (about 2 to 3 ounces of white modeling clay and 2 to 3 ounces of red modeling clay. Have one plate per team with both colors on it ready at the start of the lesson.

4. Create a supply area where teams can pick up their materials when instructed to do so. Lay out two plates for each team: One plate with the team's two colors of modeling clay on it and one plate that includes their allotment of toothpicks, coffee stirrers and a pair of scissors.

During the meeting:
1. Introduce the activity by holding up the photo of the T-bone steak. Tell the group that they're going to create a T-bone steak with a limited set of materials, learn how to evaluate meat and then put the methods to work to compare the steaks they made.

T-bone steak packaged for retail sale

2. Pass out the "Meat Science" resource sheet, pens or pencils, and scratch paper. Review the definitions and the beef, pork and lamb sections with the group. (**Note:** Depending on the ages and reading skills of your group, you may want to read it aloud or have the participants read it in small groups.)

3. Next, tell them to look at their resource sheets again and:

   ▸ **Circle** the factors that are most important in selecting higher quality *retail cuts* for each species. Answers:
   - Beef = Marbling and the least plate waste
   - Pork = Trimness
   - Lamb = Trimness

   ▸ **Underline** the factors that are most important in selecting higher quality *wholesale cuts* for each species. Answers:
   - Beef = Beef quality grade is the most important, then trimness second and muscling third
   - Pork = Trimness
   - Lamb = Trimness

   ▸ **Star** the factors that are most important in selecting higher quality *carcasses* for each species. Answers:
   - Beef = Beef quality grade is the most important, then trimness second and muscling third
   - Pork = Trimness
   - Lamb = Trimness

4. Review the answers with the group to make sure they understand the concepts.

5. Split the group into four teams of roughly equal size. Have each team move to one of the four work stations. (**Note:** Depending on the size of your group, you may need more than four teams and work stations.)

6. Tell the teams they'll have 8 minutes to make a T-bone steak using only the tooth picks, coffee stirs, scissors, plates, and white and red modeling clay provided. Tell them they don't have to use all of the resources.

7. Have one representative from each team come forward to collect their supplies when you say "go." Use a clock or stopwatch to keep time. Give the teams 2-minute and 30-second warnings.

8. After 8 minutes, or once all of teams have completed their steaks, have the teams place their steaks together in a central area. Label each steak with a number from one through four.

9. Tell the group that the judging contest is about to begin, and that during such a contest, they may not speak or touch the steaks. Inform them that they need to carefully review the steaks so they'll

be ready to answer several questions about them shortly. Have one team at a time come forward without talking and carefully evaluate each steak. At this point, participants may no longer touch the steaks.

10. Once they've all reviewed the four steaks, ask the following questions about the four steaks. Tell them to write down their responses for each question without looking at the steaks. (**Note:** If you have a smaller or younger group, have them answer verbally.

▸ How are the steaks similar? How are they different?

▸ Which steak appears to have the most marbling?

▸ Which steak appears to have the highest percentage of muscle?

▸ Which steak would you select to eat, and why?

11. Ask for volunteers to share their answers with the group.

12. Now have the participants rank the class of steaks first through fourth place on their scratch paper. Explain that the placings go from left (first place) to right (fourth place). For example, ranking the steaks 4-3-2-1 means steak 4 is your favorite and steak 1 is your least favorite. Ranking them 3-1-4-2 means steak 3 is your favorite and steak 2 is your least favorite.

13. Review the placings with the group. Reinforce how the concepts of marbling, muscle, bone content and fat deposits affect the rankings. (Note: You could also have the participants share how they ranked the class with their teammates, and work to find a common answer before reporting back to the large group.)

ADAPTATIONS & EXTENSIONS:

▸ Add a cooking lesson by having the group make their own modeling clay (search for "recipes for modeling clay" online) for this activity at an earlier meeting or at the start of this one.

▸ Have the groups create cuts of meat other than T-bone steaks with their modeling clay.

▸ Buy four steaks of the same cut and have the participants inspect them before answering the questions in step 10. If you have the time, budget and facilities, cook all four steaks to the proper temperature and have the participants taste the steaks and analyze the differences between them.

▸ Offer a prize to the person who correctly answers the most questions in step 10. (Food prizes usually work well.)

TALKING IT OVER:

Ask the group the processing questions that follow:

▸ Why were the steaks different?

▸ Why is it important to know about quality in selecting steaks?

▸ What production practices affect meat quality?

▸ What impact on meat quality could you have as a livestock producer?

▸ What could you do differently with your own animals to increase the quality of meat you produce?

ALIGNMENT TO SCIENCE AND ENGINEERING PRACTICES:

How 4-H Increases Science Literacy

Nationally and in Michigan, 4-H has long enjoyed a reputation for engaging young people in positive, experiential (hands-on), and nonformal activities that are inquiry-based. The lessons in the *4-H Animal Science Anywhere* series can be used to enhance classroom science education in Michigan and elsewhere. The lesson activities are aligned with the eight Scientific and Engineering Practices (SEP) from *A Framework for K–12 Science Education* (National Research Council, 2012, p. 42).

The Michigan State Board of Education adopted a set of new state science standards in late 2015 that are based on the SEP. The *4-H Animal Science Anywhere: Creating and Evaluating Steaks* lesson was evaluated for alignment with the SEP by MSU Extension Educator Tracy D'Augustino in 2016. The results appear in Table 1.

Table 1. How This Lesson Aligns With the Science and Engineering Practices (National Research Council, 2012, p. 42)

Science & Engineering Practice	Action	Activity Step
1. Asking questions and defining problems	▶ Participants determine which steak models best meet the quality retail factors.	9
	▶ Participants discuss the impact livestock producers can have on the quality of meat produced.	Talking It Over
2. Developing and using models	Participants build steak models designed to meet the retail quality factors they're learning about.	5–8
3. Planning and carrying out investigations		
4. Analyzing and interpreting data	▶ Participants analyze and interpret the reading resource.	3
	▶ Participants discuss what they could do differently with animals they raise to improve the quality of the meat.	Talking It Over
5. Using mathematics and computational thinking		
6. Constructing explanations and designing solutions	Participants review and evaluate the model steaks they made against the retail quality factors.	9–13
7. Engaging in argument from evidence	▶ Participants answer quality factor–related questions about the steak models they made.	10–11
	▶ Participants compare how other team members rated the steak models and worked to come to consensus on the ratings.	13
8. Obtaining, evaluating, and communicating information	Participants obtain, evaluate and communicate information about how meat quality is evaluated.	Whole lesson

4-H Animal Science Anywhere | Michigan 4-H Youth Development | Michigan State University Extension

REFERENCES & RESOURCES:

Print Resources:

Check your local library and local and online bookstores for these print resources:

▸ **AMSA Meat Evaluation Handbook.** (2013). Smith, D., Griffin, D., & Johnson, K. American Meat Science Association *(meatscience.org/page.aspx?id=539)*

▸ **Beef Marbling Photographs With Pouch,** item 06901. (n.d.). National Cattlemen's Beef Association. *(https://store.beef.org)*

▸ **Retail Meat Cut Flash Cards,** item C30003(X)N. (n.d.). NASCO, *(www.enasco.com/product/C30003(X)N)*

Online Resources:

The online educational resources listed here are free:

▸ **AGRIPEDIA: Meat Identification** (*www2.ca.uky.edu/agripedia/agmania/meatid/*) – This University of Kentucky site offers images and quizzes.

▸ **Aggie Meat: Meat Identification Pictures** (*aggiemeat.tamu.edu/meat-identification-pictures/*) – This Texas A & M site provides meat images and practice classes.

▸ **Beef Myology and Muscle Profiling** (*bovine.unl.edu/eng/index.jsp*) – Features interactive muscle images and descriptions.

▸ **4-H Meat Judging** (*agrilife.org/4hmeat/*) – Prepares young people to participate in meat judging contests and other leadership contests.

▸ **4-H Meat Judging – Online Training** (*animalscience.tamu.edu/academics/meat-science/4h/meat-judging/*) – This Texas A & M Department of Animal Science site provides online training for meat judging contests.

▸ **Youth Judging Classes: Meat Science** (*animal.ifas.ufl.edu/extension/meat/youth/judging-classes.shtml*) – This University of Florida Department of Animal Science site offers meat science-related images and practice classes.

ACKNOWLEDGMENTS:

Authors

▸ Julie Thelen, 4-H Livestock and Veterinary Science Educator, Michigan State University Extension

▸ Sarah Wells, Academic Specialist and MSU Extension Specialist in Meat Science, Department of Food Science and Human Nutrition, MSU

Meat Science

Definitions

Bone content – The amount of bone in a given carcass or cut of meat.

Cutability – The amount of closely trimmed retail cuts that can be retrieved from a carcass.

Fat deposit – Fat that has accumulated between muscles, skin and surrounding organs.

Marbling – Intramuscular fat deposits between muscle fibers; the flecks of fat visible in the lean cut surface.

Muscle – Soft, fibrous tissue that contracts in a live animal; the meat in a carcass.

Plate waste – Part of the cut that is not suitable for humans to eat.

Quality grade – Grades assigned to carcasses or cuts to categorize meat on the basis of consumer acceptability and palatability (eating quality).

Trimness – The amount of fat present in the carcass of a meat animal (trimmer carcasses have less fat).

Yield grade – Grades assigned to carcasses based on cutability. Yield grade 1 represents the highest cutability, and yield grade 5 is the lowest cutability (the fattest).

Evaluating Beef

When evaluating a retail cut of beef, two things are important: How it will taste and how much of it will be thrown away. Consumers try to ensure excellent flavor by selecting cuts with large amounts of marbling. The second priority is determining which one has the least amount of "plate waste." In other words, the one with the least external fat and the least bone is most desirable.

When evaluating wholesale cuts or carcasses the selection criteria are slightly different. The greatest importance is placed on the beef quality grade, while trimness is second, and muscling third. Beef quality grading is based on marbling and maturity. Maturity is influenced by skeletal conformation and lean color.

When judging beef, group those with similar marbling scores together, and then rank them on trimness. If the trimness is similar, then consider differences in muscling. Whether you're evaluating beef retail cuts, wholesale cuts or carcasses, it takes a lot of muscle to make up for a small difference in trimness.

Evaluating Pork

When evaluating pork cuts, the priorities are similar to beef, but different indicators are used. The most important factors in pork are trimness and plate waste. Rank the cuts based on which is the trimmest and has the least bone visible. Trimness is more important than visible bone, because trimness is usually consistent on both sides of the cut, while visible bone can vary from side to side. If cuts are similar in trimness, then consider the meat-to-bone ratio.

With pork, color is the most important indicator of quality because it helps determine which cut will be the juiciest. Pale pork can be very dry and tough to eat (this has to do with the pH of the meat and how much water escaped from the product before it was cooked). Other important quality factors are firmness and marbling. The firmness coincides with color, and generally a soft textured raw product will result in a tough, dry cooked product. Marbling is a source of flavor, so an increased percentage is advantageous.

So with pork cuts, pick the piece of meat that best balances cutability with quality. To be more exact, pork is ranked on the combination of trimness and muscling. However, if they are close, the advantage in the pair is given to the one that has the quality advantage.

Wholesale pork cuts or carcasses are ranked on trimness, and if a pair is close, muscling should determine which ranks higher. Quality only

Meat Science, Continued

matters if it is unacceptable and the wholesale cut or carcass has all three characteristics of PSE (pale, soft and exudative). ("Exudative" is the loss of moisture or puddling around the cut surface.) If all three PSE factors are present, the cut or carcass will place last due to its lack of consumer appeal.

Evaluating Lamb

Judging lamb is very similar to judging pork. Trimness is the highest priority, followed by muscling. When comparing carcasses of the same size, first look at the trimness and determine which is the trimmest. Then, look at muscling to break close pairs. In the industry, trimness and carcass weight are the only two things that influence the value of the carcass, and carcass weight should not vary within a class. (Keeping the carcass weights the same means judges can focus on the muscle differences.)

There are more or less two indicators of fatness: carcass shape and carcass bluing. "Bluing" is the amount of lean color (what consumers typically think of as "red meat color") that is visible through the fat. This only occurs in lambs that are trim enough to have muscle visible through the fat. When viewed from the top, most animals, whether live or harvested, are shaped like a Coke bottle from front to back if they are trim and heavily muscled. As they fatten, they start to develop a canoe shape.

Fat is most visible when it builds up in places where the animal has less muscle. Two of the best locations to evaluate fat thickness are over the sirloin and along the loin edge. Often, you can see the depth of fat from the side profile of the sirloin. If a carcass has a nice round muscle shape, it generally is leaner. If a carcass is flat or shapeless, then the animal has excessive fat. When the loin becomes wide and square, it is due to fat development. Bluing can be seen on all portions of the carcass, but in most cases, will show the greatest difference over the rack and shoulder.

T-Bone Steak Packaged for Retail Sale