



# LEARNING MODULES

GK-12 DISSECT at New Mexico State University

**Title:** The Case of the Bungled Bovine Bales

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**Discipline or Area:** Density Measurement

**Teacher:** Kathleen Guitar

**School:** Vista Middle School

**Subject of class:** Science

**Grade:** 6th

## **COVERAGE OF COMPUTATIONAL TOPICS**

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The concept of abstraction was introduced as a way of pulling out important information to solve a problem. Measurement and calculation of density was practiced.

## **OBJECTIVES**

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Students will learn how to abstract information and solve a complex problem using the abstracted information. Students will also learn how to measure and calculate density.

## **EQUIPMENT AND MATERIALS**

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Density cubes (4)- with different colored labels

Handout

Highlighter

Triple Beam Balance

Ruler with centimeters

Calculator

## **BACKGROUND AND REFERENCES**

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The purpose of this module is to get students comfortable with the measurement and calculation of density, which was the lesson unit for that week. This module is also meant to introduce the students to the world of genetically modified plants.

## **PROCEDURE**

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**Provide detailed instructions on how this module is taught.**

Students are given the handout, density cubes, and measurement tools. Read the handout together in class and tell them to highlight the important information needed to solve the problem of mixed up bales of hay. Make sure they understand what the problem is. Have them measure and calculate the densities then solve the problem with the knowledge given in the handout. They should have highlighted the information needed, but if they didn't, go through the paragraph with the whole class and tell them what they needed to highlight.

**What were the “learning goals?”**

The learning goals were to understand how to measure and calculate density, to begin utilizing abstraction to solve problems, and to understand more about genetically modified crops.

**How did you introduce CT?**

CT was introduced when they were taught about abstraction and how to use it to solve the problem. They had to highlight the important information and they had to fill out a data table with the important information they collected and measured.

**How could you assess the understanding of CT in this module?**

We can easily assess the understanding of the CT by looking at what they highlighted in the paragraph. Too much highlighting or too little highlighting probably means they didn't quite grasp the concept. The Computational Thinking Rubrics will be used to assess abstraction comprehension and demonstration.

## **NOTES AND OBSERVATIONS**

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**What were challenges you encountered in the overall development of the module?**

Some kids are still very slow executing directions. Almost all of the kids were comfortable with measuring mass, while most of them had difficulties with measuring volume. They thought that since the measurements for length, width, and height were the same that they could just multiply that value by three when it should have been raised to the third power. Some kids had trouble making the connection between density and bale identity even though it was clearly stated in the introductory paragraph. Most students did not effectively abstract the data; they either highlighted

way too much, or not enough information. There was an error in the handout because we did not specify the difference in densities between GS and GS-SPS hay bales. We accepted correct answers as long as the highest density and lowest density were correct. Most students assumed GS-SPS was more dense than GS alone, which is a correct assumption, indicating their comprehension of the subject.

**What was successful?**

The practice with density was successful and really helped solidify their measuring skills. Most students were engaged and understood the concept of organic versus genetically modified alfalfa. They also understood that in order to be an organic dairy farmer the cows had to be fed organic hay.

**How was the students' reception to the content of the module?**

The students were engaged and excited to figure out the identity of the hay bales in order to deliver the correct bales to the correct farmers. They were very excited when they identified them correctly. They seemed interested in abstraction, but did not grasp the concept; more practice is needed.

NAME \_\_\_\_\_ PERIOD \_\_\_\_\_

### The Case of the Bungled Bovine Bales

One day, John was out making his hay deliveries to various dairy farmers in his area. Out of nowhere, a stray cow wandered into the road. John swerved to miss the cow and his bales of hay went flying! This was a **BIG** problem because each type of bale was going to a specific dairy farmer. The first farmer, Farmer Green, on John's delivery route only fed his cows organic hay (which means the hay could have no genetic modifications, herbicides or pesticides for him to keep his organic certification). The second farmer, Farmer Trump, had paid top dollar for his bale of hay because it was over expressing SPS which made it the most dense. The third farmer, Farmer Bieber, on John's delivery route was trying out hay with GS which had proven to be more dense than the organic hay, but not as dense as the SPS hay. The fourth farmer, Farmer Scrooge, was eager for big profits so he was willing to pay for the SPS *and* GS treatments, but actually the SPS and GS hay was not as dense as the SPS hay. Use what you know about density to figure out which bale goes to which farmer so John doesn't get in big trouble for delivering the wrong hay to each farmer.

| BALE   | MASS | VOLUME | DENSITY | IDENTITY | FARMER |
|--------|------|--------|---------|----------|--------|
| WHITE  |      |        |         |          |        |
| SILVER |      |        |         |          |        |
| TAN    |      |        |         |          |        |
| CLEAR  |      |        |         |          |        |

Key

NAME \_\_\_\_\_

PERIOD \_\_\_\_\_

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| BALE   | MASS | VOLUME | DENSITY                    | IDENTITY | FARMER  |
|--------|------|--------|----------------------------|----------|---------|
| WHITE  |      |        | 0.9 g/cm <sup>3</sup>      | GS       | Bieber  |
| SILVER |      |        | 2.7 g/cm <sup>3</sup>      | SPS      | Trump   |
| TAN    |      |        | 0.35-0.5 g/cm <sup>3</sup> | organic  | Green   |
| CLEAR  |      |        | 1.2 g/cm <sup>3</sup>      | GS-SPS   | Scrooge |