The Optimization of Food: Cost versus Nutrition in a Fast Food World.

Residents: Courtney Cage & Jeff Larson
Grades 6-9
Interdisciplinary

OBJECTIVE, BACKGROUND INFORMATION, & REFERENCES

The scientific objective of this lesson is to enable our students to have a basic understanding of nutrition, and how to make educated decisions about food and money in the future. The scientific standards that will be addressed include Standards 1, 3 and 5: students apply the processes of scientific investigation and communicate their ideas, human body systems and their functions, ways that multicellular organisms get food and other matter to their cells, an understanding of noncommunicable conditions such as heart disease, and the interrelationships among science and other fields.

An understanding of carbohydrates, fats, and proteins will all be discussed. The difference between unsaturated and saturated fats will be defined. In addition, a previously established understanding of the cardiovascular system will allow the students to understand noncommunicable conditions such as heart disease, obesity, and stroke. Through a previous exercise, the students learned about nutritional facts including calories, total fat, serving size, grams of protein, grams of fiber, sodium, vitamins, carbohydrates, sugars, and percent of daily value.

References: Colorado's Standards, Wendy's nutritional guide, MyPyramid.gov, and Human Physiology: The mechanisms of body function by Widmaier, Raff, and Strang 10th edition 2006.

VOCABULARY, MATERIALS, PREPARATION, SAFETY

Vocabulary: Carbohydrate: includes things such as breads, sugars and the lactose in milk. Protein: supply essential amino acids to make proteins within the body such as antibodies that help fight disease. Protein is obtained through foods such as poultry, fish, beef, and pork. Fats: they are insoluble in water and include things such as vegetable oil and butter. There are different types of fat, those being unsaturated and saturated fatty acids. The difference between these fats lies in their chemical structure. A saturated fat is a molecule whose carbons are all linked by single covalent bonds. This makes the saturated fat more condensed compared to the unsaturated fatty acid, whose bonds contain one or more double covalent bonds in its carbon chain. These double bonds result in kinks in the molecule. When the unsaturated fatty acid integrates into the cells membrane, it allows the membrane to maintain its fluidity. This is much better for the cell and is the basis behind why unsaturated fatty acids are better for an individual then saturated fatty acids.

Materials: Students will be using their Mac computers (provided by ELA) in order to view the Wendy's spreadsheet and make decisions based on the different mathematical parameters present by Resident Mathematician Jeff Larson. They will also be able to use MyPyramid.gov as a resource to determine what would be a nutritionally healthy and balanced diet.

Students will already be familiar with basic nutrition terms (fats, cholesterol, and protein) as well as the recommended values for an average person. In math class, Residents will ensure the students understanding of what "optimal solutions" and "constraints" mean in the context of the lesson.

This lesson plan does not pose any risk to the students. General safety rules will be followed.

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5 E'S

Describe how each of the 5 E's will be accomplished:

Engage

Start with a quick mention of the goal of the lesson: to try to find all the nutrition a person needs at Wendy's for the least cost. We'll then have a quick review of nutrition, as well as recommended values for fat, protein etc. We will use MyPyramid.gov as a review and resource.

Explore

Have the students (alone or in groups) explore different possible purchases on their own, using the available spreadsheet. This will allow them to come up with an answer that makes mathematical sense, but not necessarily nutritional sense.

Explain

The initial spreadsheet has everything from Wendy's menu including all free foods (ketchup, mustard, crackers). It's likely that students will find a way to meet all their nutritional requirements without spending a penny.

Elaborate

As with most math problems, students should check how realistic their answer is. Eating a day's worth of Wendy's mayonnaise probably won't satiate most people. Hopefully, most students notice such an answer isn't realistic and will reevaluate. We'll discuss the health ramifications of such a diet, remove the free menu items, and go back to the explore stage.

Even without free items, it's possible to meet all nutritional requirements with a very limited menu. (A couple of loaded baked potatoes and a bowl of chili satisfy the constraints.) Again, we can hop back and forth from the math and science to talk about our answer, and ways to improve it.

Evaluate

We will have all students hand in two things: 1) Their thought process in finding a mathematically optimal meal and 2) How the nutritional content of that meal compares with what they know to be healthy.

PEER REVIEW COMMENTS