



Science Objectives

- Students will be able to use a Body Mass Index (BMI) score as a tool for general health.
- Students will analyze the caloric and nutritional value a select group of foods and beverages.
- Students will describe the short- and long-term impact of nutritional choices on their health.
- Students will explore the influence of exercise for maintaining a healthy weight.

Vocabulary

- | | |
|-------------------------|------------------------------|
| • Body Mass Index (BMI) | • Biometrics |
| • underweight | • Basal Metabolic Rate (BMR) |
| • overweight | • fats |
| • obese | • carbohydrates (carbs) |
| • protein | • Calories |
| • Body Fat | • Healthy Weight |

About the Lesson

- In this lesson, students will use TI-Nspire technology to model and explore factors that influence a health weight.
- As a result, students will:
 - Use the Body Mass Index (BMI) score for measuring general health.
 - Explore nutritional value of some foods and beverages.
 - Understand the impact of nutritional and exercise choices on health.

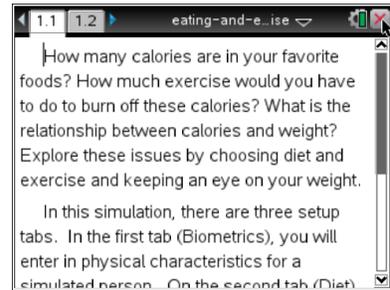


TI-Nspire™ Navigator™

- Send out the *Eating_and_Exercise.tns* file.
- Monitor student progress using Class Capture.
- Class Capture to collect simulation results and compare
- Use Live Presenter to allow students to show how they manipulate variables that effect results.

Activity Materials

- Compatible TI Technologies: TI-Nspire™ CX Handhelds, TI-Nspire™ Apps for iPad®, TI-Nspire™ Software



Tech Tips:

- This activity includes screen captures taken from the TI-Nspire CX handheld. It is also appropriate for use with the TI-Nspire family of products including TI-Nspire software and TI-Nspire App. Slight variations to these directions may be required if using other technologies besides the handheld.
- Watch for additional Tech Tips throughout the activity for the specific technology you are using.
- Access free tutorials at <http://education.ti.com/calculators/pd/US/Online-Learning/Tutorials>

Lesson Files:

Student Activity

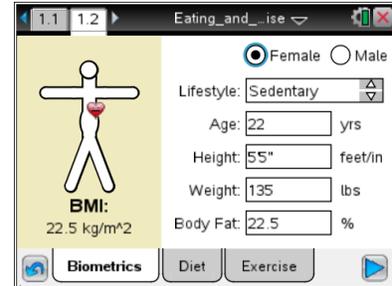
- Eating_and_Exercise_Student.doc
- Eating_and_Exercise_Student.pdf
- Eating_and_Exercise.tns



Discussion Points and Possible Answers

Start on page 1.1 Biometrics Tab.

In this first part of the activity, students will look at biometrics, diet, exercises and activities as an assessment of health. The biometrics tab will allow them to alter age, gender, lifestyle, height and weight. It will use height and weight to calculate BMI. The other biometrics (like age) will play into the later simulation (namely BMR).



1. Students should attempt to change each variable to see which affect the value for BMI.
2. Your students will be looking for biometrics that classify as underweight, normal, overweight and obese to help them to understand what these BMI ranges mean. Students should calculate their own BMI in Q1, and then reset the biometrics showing a healthy adult, age 22, selecting male or female. You may need to limit the inputs to only those that are humanly possible.



Tech Tip: The height can be entered as inches or as feet and inches. If entering the height as feet and inches, students should use single and double quote marks to note the height. For example, 5' 7".



Tech Tip: When students select Age, Height, or Weight, the keyboard will appear on the screen. To enter numerical values, students should select the button ".?123" to the left or right of the space bar. They can select "return" to return to the main screen.

- Q2. Which variables do not influence BMI? What are the implications of those variables not being included in BMI?

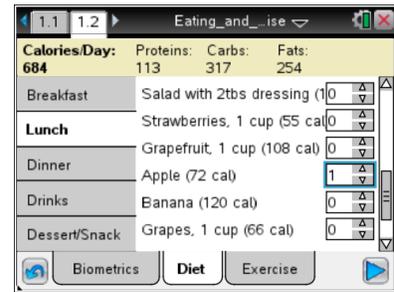
Answer: Only height and weight are used to calculate BMI $\frac{\text{weight (lb)}}{(\text{height (in.)})^2} \times 703$. This can

underestimate a "healthy weight" for an athlete and overestimate a healthy weight for an elderly person.



Move to the Diet tab.

Students will have the opportunity to scroll through various categories of food, and select specific items. In order to be “selected” set the number of the food to be consumed to anything but 0. While it is not possible to directly read the Calorie content of any single food in this simulation, this can be inferred by how much the daily calorie intake changes when a food is added.



Q3. Which biometrics influence BMR?

Answer: Gender, age, and size all influence BMR. The Lifestyle category adjusts for a sedentary or active lifestyle, which was selected on the first tab, biometrics.

Q4. Is BMR related to BMI?

Answer: BMI is calculated from height and weight. BMR also uses height and weight, in addition to age and gender.

Students can start with any amount of food for the first trial run. Choosing a total of near 2,000 calories +/- a few hundred will keep the simulation values on the graph for the duration, but suggest the students pick a quantity of food that is reflective of what they eat daily.

3. Students will create a menu of any food they like. For the first simulation, there are no limits to the food they can select. You may need to cut off the amount of time they spend on this by suggesting they will come back to edit this later.

Although protein, fat and carbohydrates (carbs) are noted for the selected diet, they do not influence the weight simulation at the end. You may choose to discuss how different foods provide different nutrients, and that a low-fat diet is proven to decrease the long term risks of heart disease and that a mix of proteins and carbohydrates in a diet are essential for feeling energetic, which is not measured in this graph.

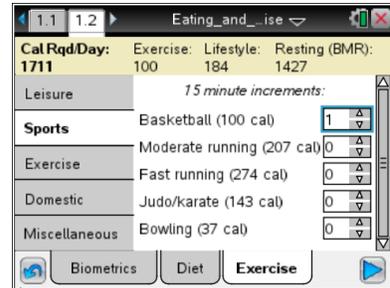
Move to the Exercise tab.

Students will see how the biometrics they have chosen influence the Basal Metabolic Rate (BMR) and lifestyle numbers. You may ask for volunteers to share this number. They will add some activities, but at this stage it is not important that the calories burned and calories eaten match up. Again, remind students that they will come back to this section to make changes if they spend too much time here.



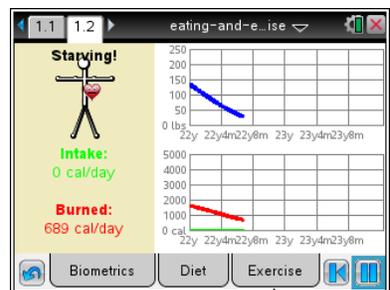
4. Students will run a simulation based on the parameters they have selected by selecting play .

5. Students should sketch a copy of the graph on their worksheet. At the end of the simulation, you may choose to have students estimate the final BMI. Did it increase or decrease? Is it still healthy? Most likely, your students' simulations will have gone off dramatically in one direction or another.



Repeat the lifestyle model.

6. Students will go back to adjust parameters of the simulation to help answer the analysis questions. You may encourage them to work in groups to make comparisons.



Q5. Can you create a model that does not gain or lose weight over time? What is the relationship between eating and exercise in this model?

Answer: To create a model that doesn't gain or lose weight, the calories eaten should match the calories burned.

Q6. Using that healthy model, what happens when you add an hour of Exercise to that model? Is this still healthy?

Answer: The simulation will quickly and dangerously drop weight. This is very unhealthy.

Q7. Can you adjust the Exercise heavy model to make it healthy?

Answer: By adding food to account for the extra exercise, this becomes a healthy model.

Q8. Which plays a bigger role in weight, diet or exercise or neither?

Answer: Neither, they play equally important roles.

7. To create a new simulation with different variations, use the reset button , and it will prompt students to select which parameters (including the selected food and activity) to delete. They may



prefer to write down their selected food and exercise if they want to use the same base selections (this is not essential).

8. They will need to create a simulation with an extra hour of exercise on top of a normal selection, this should exacerbate weight loss. To prevent this weight loss, students should add extra food. Diet and Exercise selections can be added while the simulation is running.

Students will need to select approximately 100 calories foods. They should explore these numbers on their own, but here are some suggestions that are about 90-110 cal (there are others): 1 cup cornflakes, 2 tbs of pancake syrup, 2 cups strawberries, apple, banana, 3 cups cauliflower or 1 cup skim milk

- Q9. How is the model influenced when you add 100 calories of food to the diet every day? When you subtract 100 calories?

Answer: Adding 100 calories per day will result in weight gain. Subtracting 100 calories per day will result in weight loss.

Students are to add a large fast food meal to the diet.

- Q10. How many Calories does a large fast food meal have?

Answer: A fast food meal adds 1,355 calories per day.

- Q11. How does the model change when you add an extra fast food meal every day? How can this be included in a healthy lifestyle?

Answer: To counteract that, add 3.5 hours of running or other high intensity exercise daily.

Have students answer the questions on the Student Activity sheet.



TI-Nspire Navigator Opportunities

Allow students to volunteer to be the Live Presenter and demonstrate how to adjust the Biometrics, Diet, and Exercise selections. Use Quick Poll to check for understanding during the course of the activity.



Wrap Up

When students are finished with the activity, collect students' worksheets.

Assessment

- Formative assessment will consist of questions embedded in the student worksheet. Analyze questions in the student worksheet with the students.
- Have students create a report that shows at least two "healthy" lifestyles and explain what makes them such.
- Summative assessment will consist of questions/problems on the chapter test.