Designing a Healthier, Happier Meal Engineering Portfolio

This portfolio belongs to:

What Is Obesity?

What does the word "obesity" mean? Answer each question in the chart below and create new rows with additional information to show what you already know about obesity. As you explore the links provided, continue to expand upon and refine your ideas based on research.

What is obesity?
What causes obesity?
How does obesity affect health?
How can people fight obesity?

Food and Nutrition

1. What is a calorie?

2. Explain the concept of nutrient density. Give examples of foods that are and are not nutrient dense.

3. What is the effect of physical activity on weight over time? Explain in terms of calories.

4. Does the body burn most of its calories through basic metabolic functions or through exercise? Justify your answer.

5. What is cellular respiration? How does it compare to photosynthesis?

Typical Fast Food Meal

As you explore the resources provided, take notes below.

1. Which food groups are represented in the photo? Are there any missing? Which ones?

2. Is the "grain" portion in this meal a whole grain or a refined grain?

3. To what extent are the calories in this meal accompanied by nutrients?

4. How many grams of fat are in this meal? How much of this fat is made up of saturated fat or trans fat?

5. What percentage of a 19- to 30-year old man's daily caloric intake does this meal represent?

6. What percentage of a 19-to 30-year old woman's daily caloric does this meal represent?

7. What percentage of a 4- to 8-year-old child’s daily caloric intake does this meal represent?

Supersizing

Portion sizes have grown steadily over the years—but recommended serving sizes remain the same.

1. Exactly how much have portion sizes increased over the last 20 years? Give three examples from the online quiz and calculate the percentage increase in calorie count.

2. What evidence did you find that increasing portion sizes leads to increased caloric intake?

3. In light of your answers to the first two questions, do you think restaurants have a responsibility to serve portion sizes that reflect recommended serving sizes? If restaurants do not voluntarily do this, should state governments have the authority to regulate portion size in restaurants? Justify your answer, citing information from New York City's attempt to ban "supersized" soft drinks.

Fast Food Marketing

Fast food companies spend a lot of money on advertising and marketing to get people to buy their products. Think about some of the ads you have seen, and answer the following questions.

1. Which strategies do fast food companies use to get consumers to buy their products?

2. What impact has fast food advertising had on your consumption of fast food?

3. How do advertisers appeal to children? Support your answer with evidence.

4. Do you think it is ethical for fast food restaurants to market unhealthy foods to children?

   Justify your answer.

A Legal Matter

Two girls brought a suit against McDonald's arguing that eating their food made them obese. Is this lawsuit frivolous or justified? As you explore the links provided, write down the evidence and arguments that support each point of view. When you are finished collecting evidence, decide which side you support and write an argumentative essay that supports your claim. Use separate paper to write your essay, or you may use the additional writing paper at the end of this portfolio.

Frivolous or Justified

This lawsuit is frivolous.	This lawsuit is justified.

The Engineering Design Process

How can you create a healthier, happier meal than the typical fast food restaurant? Use the engineering design process outlined below as your STEM team works on this project.

1. **Define the Problem:** Develop a problem statement that clearly and concisely identifies the challenge that will be addressed. Write it below.

2/3. **Brainstorm, generate ideas and research**: Work with your STEM team to brainstorm answers to the following questions:

- What kind of meal would you like to create?

- What are some ideas for the components of your meal?

4. Identify Criteria and Constraints: Write criteria and constraints below.

The Engineering Design Process

5. **Explore Possibilities: Mathematics**
Use the MyPlate website to find out more about the U.S. government's recommendations for a healthy child's meal. Write your answers below. If you need additional space for writing, use the extra notes pages at the end of the document.

- What are the five food groups that people should aim to eat at each meal?
- What percentage of your plate should be fruits and vegetables?
- What percentage of your grains should be whole grains?
- About how many calories should a 4- to 8-year-old child consume each day?
- Assuming a child consumes one-third of his or her daily calories at lunch, how many calories should his or her lunch contain (including drink and dessert)?
- What is the limit on "empty calories" that a 4- to 8-year-old should consume each day?

After looking at the chart with data on nationally available children's meals, use the information to answer the questions below.

- What is the range of calorie counts for this entire data set? What is the average calorie count? Do these numbers surprise you? Why or why not?

- Now look at just the higher calorie meals. What is the range, average and inner quartile for this data set? How does the average calorie count compare to the number of calories you determined that a 4- to 8-year-old should consume for lunch?

- Now look at just the lower calorie meals. What is the range, average and inner quartile for this data set? How does the average calorie count compare to the number of calories you determined that a 4- to 8-year-old should consume for lunch?

- What is the difference in calories between the average higher calorie meal and the average lower calorie meal?

- Are there certain food items that turn up frequently in higher calorie meals? What about lower calorie meals?

- Based on your analysis, what advice would you give to families seeking lower calorie children's meals?

- What have you learned that will help you create your own children's meals?

The Engineering Design Process

Explore Possibilities: Biology

In this lab activity, you will test children's meals for the presence of lipids (fats and oils), starch, sugar and protein.

Before beginning the lab, think about what you expect to find. Will all the components of the meal contain every macromolecule? Will some macromolecules be present only in certain parts of the meal? Write your hypothesis below.

As you complete the macromolecule lab, record your findings using the table below. Use the extra space to take notes.

	Biuret test (protein)	**Sudan IV test (lipids)**	**Benedict's solution test (simple sugars)**	**Iodine (IKI) solution test (starches)**
Food item:				
Food item:				
Food item:				
Food item:				
Food item:				

The Engineering Design Process

Explore Possibilities: Biology, continued

After you have completed your lab, write up a lab report using the form outlined below. If you need more information about how to complete specific sections, you may refer to the following link: LabWrite

- Title: Give your lab report a descriptive title.
- Abstract: Write a one-paragraph summary of your entire lab report. The abstract should be concise and clearly describe the purpose and outcomes of your experiment.
- Introduction: Describe what the lab is about and what you were trying to find out, providing some background information about the subject matter you investigated. Describe in brief the methods you used to conduct your experiment, and how that data you collected helped you answer your question. Include your hypothesis, and whether or not the data you collected supports your hypothesis.
- Procedure: In paragraph form, describe how you conducted your experiment, including the materials and procedures employed. Provide enough detail so that someone else could replicate your experiment on his or her own using only your lab report.
- Results: Report the outcome of your experiment. Start with one or two sentences describing the most important findings. Then go into more detail, presenting charts, table or graphs that contain the data you collected. Remember to label your charts, tables and graphs—and refer to each one by its label as you describe it in more detail.
- Discussion: Interpret your results by describing how they fit in with data that others have collected, whether or not your results matched your hypothesis, and how your understanding of the subject matter may have changed over the course of the experiment. Include any problems you ran into and discuss how you would do things differently if you had the opportunity to conduct the experiment again.
- Conclusion: Write a paragraph summarizing what you have learned by completing the lab.
- References: Record in APA format all sources of information you used to complete the lab, including newspapers or websites you may have used to describe the overall subject area in your introduction.

Complete your lab report of separate paper.

The Engineering Design Process

Explore Possibilities: Social Studies

What menu items are popular in the following countries? Describe any cultural significance to the menu items offered in these countries.

Country	Popular Menu Items	Cultural Significance of Menu Items
Brazil		
China		
Germany		
India		
Russia		
Saudi Arabia		
Singapore		
South Africa		

Use your research to expand your thinking about the kinds of food that you could offer in the fast food meal that you are developing for children. Write some ideas below.

The Engineering Design Process

Explore Possibilities: Art

How will you design packaging for your children's meal? After you have conducted some research on existing children's meal packaging, answer the following questions with your team:

- How will the packaging of your children's meal appeal to kids, who will be eating the meals?

- How will it appeal to parents, who will be buying the meals?

- Will your packaging contain elements that will entertain children? If so, how?

- Will your packaging contain elements that will keep components of the meal separate? If so, how?

The Engineering Design Process

Explore Possibilities: Health

What kind of meal would you like to create?

Record your ideas below. You have space for four different meal ideas. For each idea your team comes up with, list the different components of the meal. Then write down the food groups represented, and estimate the cost of the ingredients and the time it might take to prepare the meal. Use the link provided on the website to calculate the calories included in each meal.

Option 1:	Option 2:
Option 3:	Option 4:

The Engineering Design Process

6/7. **Select an Approach and Develop a Design Proposal**
Select an Approach: Which of the possibilities you have explored seems like the best solution? As you decide, think about:

- How will you incorporate a balance of the five food groups?
- Will your meal include meat, or will it be vegetarian?
- Will your meal require a fork, knife or spoon?
- What will you include for a healthy drink?
- Will your meal contain a side dish or dessert? How will that affect the overall nutrition of your meal?

Briefly describe your approach below:

7. Develop a Design Proposal:

Now that you have selected an approach, your team will need to write up a design proposal that explains your choice. Include each of the following components in your proposal. Write your design proposal on the next three pages.

Introduction: Briefly introduce the problem at hand—our nation's growing obesity epidemic and a lack of healthy fast-food meal options for children—and explain how your children's meal will help solve this issue.
Objective: Outline the goal and makeup of your proposed children's meal, including constraints and limitations.
Design Strategy: Describe how your proposed children's meal will achieve the objectives that you have listed. Explain the science behind your children's meal, and provide detail on why the meal you propose is the best one.
Plan of Action: Describe the steps you will take to create and market your meal.
Verification Plan: Create a plan for ensuring that your meal is feasible to produce and acceptable to consumers.
Predicted Cost and Schedule: Estimate the cost of creating your children's meal and include an estimate of how long it would take to create.
Statement of Contribution of Each Team Member: Describe how each team member contributed to the development and selection of your children's meal and the creation of the design proposal.

The Engineering Design Process

Design Proposal

Introduction:

Objective:

Design Strategy:

The Engineering Design Process

Design Proposal (continued)

Plan of Action:

Verification Plan:

The Engineering Design Process

Design Proposal (continued)

Predicted Cost and Schedule:

Statement of Contribution of Each Team Member:

The Engineering Design Process

8. **Make a Prototype** of you meal. After you create your meal, if possible, take a picture of it and paste your picture on this page.

The Engineering Design Process

9. **Test and Evaluate.**

Gather feedback from taste testers. Record the number of people who respond to each section of the survey. A rating of 5 is most appealing.

Questions	1	2	3	4	5
1. How would you rate the taste of this meal, on a scale of 1-5?					
2. How would you rate the look of this meal, on a scale of 1-5?					
3. How would you rate the packaging of this meal, on a scale of 1-5?					

Question	Yes	No
4. Does this meal and its packaging appeal to you as much as your usual fast food meal? Why or Why not? (Record the different responses that people give. You may paraphrase.)		

Additional comments:

The Engineering Design Process

10. **Refine Your Design:**
How will you refine your design in response to comments from your taste testers? Record your ideas below.

The Engineering Design Process

11. **Communicate Results:**
Create a print or video advertisement that describes your children's meal and the work you have done in creating it. Remember to include:

- an image of your children’s meal
- a short summary of how it complies with the USDA's nutritional guidelines
- a summary of what you did to create the meal and the packaging
- results from your taste test
- the cost of your meal and the time it takes to prepare
- how your meal is an improvement over a typical fast food meal for kids

Record your ideas below. Then start creating!

Notes

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