

# The Muffin Man and the Healthy Kids Act

Katie Brouwer • Family & Consumer Sciences, Grades 10-12 • Roland-Story High School, Story City, Iowa



**Introduction:** The Muffin Man and the Healthy Kids Act project was developed as a “problem-based learning scenario.” Students were given many choices and options to produce a solution to a baking challenge: *baked goods sold and served during in-school hours should meet USDA Healthy Kids Act “Smart Snack” standards.*



**A Baker's Dozen Smart Snack Baking Tips & Recipes**  
[www.homebaking.org/PDF/smart\\_snacks\\_bakersdozen.pdf](http://www.homebaking.org/PDF/smart_snacks_bakersdozen.pdf)

## Smart Snack Baked Goods guidelines are a baking challenge! Each serving must be:

- Calories:** 200 calories or less
- Whole grain:** **50 percent** or more whole grain ingredients by weight
- Sodium:** 200 mg or less
- Total Fat:** 35% of calories or less
- Saturated fat:** Less than 10% of calories
- Trans fat:** 0 g
- Sugars:** 35% by weight or less

## Outcomes planned:

- Baking Food Safety (right) and food service sanitation will be applied.
- Lab groups will develop a USDA Healthy Kids Act Smart Snack muffin.
- Muffins will be **sensory analyzed** with peers for potential market success.
- Lab groups will create a **Product Development Report**.
- Accurate U.S. volume measurement and metric equivalents with digital scales will be conducted.
- Resource management and recipe conversion to a 6 muffin recipe.
- Pre-ordering and *mis en place* essential to produce acceptable, replicable products.
- Team work skills and the processing of multiple opinions.
- Sensory taste testing and calculations to evaluate consumer acceptance.
- Know each ingredient's functions and ratios (Ex: muffin batter ratio = 1:2, liquid : flour).
- Calculate nutrition analyses of recipe(s): the original and if ingredients change.
- Food ingredient label required; Nutrition Facts label interpretation in serving size, grams and % of DV.
- Cost of product (recipe cost) and per serving (6 muffins) cost.
- Critical thinking to problem solve product failures, consumer preferences and Smart Snack guidelines.
- Evaluating family and personal nutrition changes they could make.



## Measurable objectives:

- Demonstrate communication, problem solving, and teamwork to solve the stated problem.
- Practice personal hygiene, baking and food service sanitation for product preparation and sensory analysis.
- Demonstrate accurate measuring skills using the metric system and digital scales.
- Evaluate ingredient interactions and functions in the taste, texture, and appearance of a muffin.
- Analyze ingredient combinations to meet the nutritional requirements and consumer acceptance range.
- Communicate their learning process through a written report.

The problem interested and inspired students to learn quick bread ingredient functions and workable substitutions, measurement and mixing methods, nutrition analysis of recipes, product sensory analysis, consumer product testing science, and costing. All of these challenges were in the context of consumer product acceptance—students in grades 9-12 and NOT preparing test product.

I am proud my students can now hear the phrase “Healthy Kids Act” and have a new perspective. They’ve gained a greater appreciation and understanding of the work our school’s nutrition staff is tasked with and how hard it is to find a balance between nutrition, taste and consumer preferences.

Katie Brouwer, FCS teacher



## Family & Consumer Sciences Standards (2018, 3.0) Nat'l Association of State Administrators of Family & Consumer Sciences, nasafacs.org)

### Area 8.0 Food Production and Services

#### 8.4 Demonstrate menu planning principles and techniques based on standardized recipes to meet customer needs.

- 8.4.5 Prepare requisitions for food, equipment, and supplies to meet production requirements.
- 8.4.7 Apply principles of measurement, portion control, conversions, food cost analysis and control, terminology, and pricing to menu planning.

#### 8.5 Demonstrate professional food preparations methods and techniques for all menu categories to produce a variety of food products that meet customer needs.

- 8.5.3 Utilize weights and measurement tools to demonstrate knowledge of portion control and proper scaling and measurement techniques.
- 8.5.10 Prepare breads, baked goods and desserts using safe handling and professional preparation techniques.
- 8.5.14 Demonstrate cooking methods that increase nutritional value, lower calorie and fat content, and utilize herbs and spices to enhance flavor.

### Area 9.0 Food Science, Dietetics, & Nutrition

- 9.2 Apply risk management procedures to food safety, food testing, and sanitation.
- 9.2.5 Demonstrate practices and procedures to assure personal and workplace health and hygiene.
- 9.3 Evaluate nutrition principles, food plans, preparation techniques and specialized dietary plans.
- 9.3.5 Analyze recipe/formula proportions and modifications for food production.
- 9.6 Demonstrate food science, dietetics, and nutrition management principles and practices.
- 9.6.4 Create standardized recipes.
- 9.6.6 Analyze new products.

## Lesson Timeline:

- Day 1:** Introduce project with example of Healthy Kids Smart Snack muffin; review Smart Snack guidelines, how to analyze recipe and product for goals using **Example Recipe Analysis**; provide Product Development Report Rubric guide (below), student resource list, Baking Food Safety check list. Students form test kitchen groups of 2-3.
- Day 2:** Students research ingredient substitutions, decide on preliminary recipe, do nutrition analysis to determine how far away from the goal the recipe is in its original form; submit ingredient request (using the **Recipe Submission Form**).
- Day 3:** Student teams produce Trial #1, preliminary (control) muffin; evaluate (using **Product Evaluation Form**); identify categories found **not** 60% acceptable. Discuss/hypothesize how to adjust recipe if improvements required; begin written report on Trial #1.
- Day 4:** Class discusses recipe problems and solution hypotheses; return to groups, students direct recipe adjustments; submit Trial #2 ingredient request.
- Day 5:** Provide ingredient unit costs for each requested ingredient in final trial bake; review product costing math procedures as needed. Student-directed work time (lab testing, analysis, product costing, report writing).
- Day 6:** Produce final recipe and prepare for group taste test.
- Day 7:** Complete **Product Development Report**; report to group and submit.



**Product Development Report** Each group's Product Development Report will include:

**Page 1: Title Page** – Group's names, recipe title, sensory description, product photo

**Page 2: Recipe** – Title, Yield (six muffins, one serving's net weight)

Ingredients list (list in order used, with US volume AND weight measurement); pan size

Preparation Instructions: Oven temperature, food safety and preparation methods

Bake time range; product doneness test and internal temperature

Cooling, safe handling, serving and packaging instructions

**Page 3: Recipe Development** – Provide two paragraphs:

Paragraph one: Product Sensory Goals (May include: What ingredients are "highlights"?)

Describe appearance goals, aroma, texture. What will make your recipe uniquely appealing that you would market to consumers?)

Paragraph two: Development Process Reflection (May include: Describe what went well. What was hardest?

What were challenges and how did you overcome them?)

**Page 4: Nutritional Analysis** – Using [CalorieCount.com](http://CalorieCount.com) enter ingredients, servings for nutritional information to create a food label, plus 1 or 2 sentences of the "nutritional highlights." Do the math to calculate percentages or amount of fat, sugar, sodium, and whole grains ingredients for a serving.

NOTE: Your product must fit the Healthy Kids Act [Smart Snack Nutrition Regulation](#)

**Page 5: Food Costing** – Determine the cost of one recipe using the food costing form (copy into your doc).

Decide what to charge for each item to make a profit and what your customer can afford.

**Page 6: Table Tent** – Create a "Table Tent" to display with your finished product

- Name of product and price per item—what will your product cost?
- Ingredients (Listed from greatest to least amounts) with allergens in bold
- Nutrition Facts label—include net weight for each serving



## Product Development Report Rubric

Document components:		
Title Page	Lists all information	2
Recipe Development	Lists all information	10
Nutritional Analysis	Lists all information; must meet the nutritional requirements	10
Food Costing	Lists all information	10
Table Tent	Lists all information	5
Overall workmanship	No spelling, grammar, punctuation errors on completed work; Keep a cohesive feel to entire project; Show creativity and pride in work	15
Lab components:		
Teamwork	Is respectful and inclusive of group members	20
Lab planning, ingredient request form	Recipe is developed with consideration of time constraints; needed ingredients are requested in a timely manner	10
Muffin method	Appropriate techniques are followed	10
Efficiency in the kitchen	Team works quickly and safely to complete the lab	10
Sanitation	Applied Baking Food Safety methods, internal temps/doneness checked Food handling and packaging followed food safe guidelines Kitchen is left clean without prompting	10
Product edibility	Product developed is consistent with the standard characteristics of a muffin/loaf bread; flavors and appearance are desirable	20
Conduct consumer sensory evaluation	All sensory categories evaluated; tally category results and quantify by %	15
Hypothesize, problem solve	Identify any problem category (less than 60% positive),	10
Product costing	Hypothesize how to correct	5
Identify market	Cost product and identify consumer market group	13
<b>Total Points (175 possible)</b>		

# Recipe Nutritional Analysis

## Example: Basic Muffin Recipe

Yields six (2.25 oz/63 g) muffins

1 cup (4.25 oz/120 g) all-purpose flour

¼ cup (1.75 oz/50 g) sugar

1½ teaspoons (6 g) baking powder

¼ teaspoon salt

½ large whole egg, beaten

(2 Tablespoons/0.9 oz/25 g)

½ cup (4 oz/115 g) milk

2 Tablespoons + 1½ teaspoons

(0.9 oz/26 g) vegetable oil

Analyze ingredient list

on a Recipe Nutrition

Calculator website:

[www.caloriecount.com/](http://www.caloriecount.com/)

[cc/recipe\\_analysis.php](http://cc/recipe_analysis.php)

### Nutrition Facts

Amount Per Serving		% Daily Value*	
Calories	186	Calories from Fat 71	
		% Daily Value*	
Total Fat	7.9g	12%	
Saturated Fat	1.3g	7%	
Trans Fat	0.0g		
Cholesterol	20mg	7%	
Sodium	115mg	5%	
Potassium	167mg	5%	
Total Carbohydrates	25.9g	9%	
Dietary Fiber	0.6g	2%	
Sugars	9.3g		
Protein	3.5g		
Vitamin A	1%	Vitamin C	0%
Calcium	8%	Iron	6%

**Nutrition Grade B**

\*Based on a 2000 calorie diet

**ASK:** Does the muffin meet Smart Snack Nutrition Standards? (See guidelines pg. 1)

Using the **Basic Muffin Recipe** example:

**Calories:** 186 calories per muffin ☺

**Whole grain:** 0 ☹

**Fat:** 38% calories come from fat (71÷186) ☹

**Trans fat:** 0.0g ☺

**Sodium:** 115mg ☺

**Sugar:** ≤ 35% of weight from total sugars

One serving = 9.3g sugar ÷ 63g = 14% ☺

## Additional HomeBaking.org lesson resources:

[Baking for Special Needs](#) (Ingredient substitution lab resource for gluten-free or allergies)

[Difference Between Baking Powder & Baking Soda](#)

[Ingredient Functions](#) (PowerPoint presentation)

[Ingredients & Substitutions](#) (PowerPoint presentation)

[Methods for Mixing and Baking Muffins](#)

Pan preparation; muffin mixing method guide

### Test kitchen muffin innovations

[Whole Grain Baking 101](#)

What ingredients are **whole grain**? Visit Glossary, [HomeBaking.org](#) or [WholeGrainsCouncil.org](#)

[Home Baking Organization Members](#)

[Land o Lakes Muffin Recipes](#)

### Measurement skill-building:

[Dry flour measurement](#) (How-to video)

[Liquid measurement](#) (How-to video)

[5-Minute Baking Activity:](#)

“Scoop, Spoon, Scale – Compare & Contrast”

[Level-Headed Measuring](#)

[Weighing Ingredients:](#)

[Your Measure of Success](#)

(King Arthur Flour)



## Recipe Submission Form

Group members: \_\_\_\_\_

Lab: \_\_\_\_\_

Recipe Title: \_\_\_\_\_

Yield: \_\_\_\_\_

(Adjust recipe to yield 6 medium-sized muffins)

**Write your recipe** (ingredients and directions) on a note card! *Turn in your note card with this page!*

**Make sure the ingredients are listed in weight** unless one tablespoon or less or being used by a unit (1 egg).

**Calculate your recipe's cost.** Use the unit cost chart provided to calculate each ingredient cost. The package will provide net weight or volume measure in each package to assist in finding the fraction of the total unit cost you used.

Ingredients available:	Amount: weight in oz/g	Ingredient costs: \$0.00	Ingredients available (cont.):	Amount: weight in oz/g	Ingredient costs: \$0.00
All-purpose flour			Vanilla		
Whole wheat flour			Honey		
Oatmeal			Maple syrup		
Cornmeal			Blueberries		
White sugar			Strawberries		
Powdered sugar			Bananas		
Brown sugar			Poppy seeds		
Baking powder/baking soda			Lemon juice		
Salt			Cocoa		
Oil			Applesauce unsweetened		
Butter			Vanilla yogurt (non-fat)		
Egg			Sour cream		
Milk			Mini semi-sweet chocolate chips		

# Product Evaluation Form

Group members: \_\_\_\_\_ Recipe Title: \_\_\_\_\_

**Nutritional requirements:** Lab group must first do nutrition analysis to be sure the product meets nutritional requirements.

**Batter quality:** When you made the batter, was the consistency a **drop batter**? Too much liquid? Too dry? Was the batter liquid to dry ingredients ratio incorrect?

**Evaluate** the muffin using the **Sensory Analysis Test Form** (below) to evaluate: Appearance (muffin size, pebbled top, appealing color) Aroma, Taste, Texture

**Calculate scores** for each category. (See **How to Calculate and Apply Results**)

Do you need to make changes? \_\_\_ yes \_\_\_ no



Change needed and why?	Hypothesis on how or what to change:

Trials 2, 3, or more: Re-write your recipe to re-test. Re-analyze nutrition facts.

If new recipe meets requirements, prepare Recipe Submission to order ingredients.

## Sensory Analysis Test Form

Recipe Trial # \_\_\_\_\_

Number of consumers in taste test \_\_\_\_\_

**3 points** = DELICIOUS!

**2 points** = just ok

**1 point** = something has to change

Muffin Score 1, 2, 3	Appearance	Aroma	Taste	Texture	Comments
Lemon Zucchini					
Strawberry					
Banana Oatmeal					
Pumpkin Spice					
Pumpkin-Coco					
Triple Berry Blast					
Cherry Chocolate					
Maple					

Rank product: Top Choice: \_\_\_\_\_ Second Choice: \_\_\_\_\_

## How to Calculate and Apply Results

**60% or higher ranking is essential to the success of the product in the marketplace.**

A perfect score in each category is 3 points for each taster

Steps:

1. Find a perfect score. Multiply number of taste testers × 3 pts.
2. Total the score in each of the four categories.
3. Divide the total score in a category by a perfect score  
(Step 1) = % acceptance

*Note: You need a score of at least 60% of perfect score to be "ready to sell."*

### EXAMPLE:

15 people taste-tested Lemon Zucchini, so a perfect score would be **45** (15×3 = 45) and **60% = 27**

#### Category: Appearance

4 marked 3 (4×3=12 points)

4 marked 2 (4×2=8 points)

7 marked 1 (7×1=7 points)

For a total of 27 points

27÷45=60%

This category is **Just OK (60%)**, but COULD improve to sell really well. If a category is less than a 60% approval, you must find ways to improve that category to sell.