Food Science and Technology – Career Development Event
Highlights of Updates to Ohio State Contest beginning with 2014 Event

Food Safety and Quality Practicum

Customer Inquiry – Each participant will be given five scenarios representing general consumer inquiries. Participants must determine if the consumer inquiry reflects a quality or safety issue (3 points each) and determine if the concern or hazard is biological, chemical, or physical in nature (3 points each). *The format of this section has changed for 2014. Participants will no longer write a letter in response to the customer.*

Food Safety/Sanitation ID – Each participant will be shown 5 pictures. The pictures may or may not show a violation of good manufacturing practices (GMPs), sanitation, food handling/storage and other pre-requisite programs. A list of violation categories including the option of no violation will be provided. Participants will identify which category best describes each picture. *The category list has changed for 2014. Improper sanitation has been added as a category and safety hazard has been removed as a category.*

Food Analysis - This practicum consists of 5 questions. The question may be a description of a product and an attribute that needs tested OR a picture of an instrument. Students will select the name of the instrument from the provided list. A list of possible instruments will be available in advance of the contest. *This section is new for 2014.*

Sensory Evaluation Practicum

Triangle Tests – 4 different triangle tests will be conducted. Participants are expected to evaluate the 4 samples provided and identify which one is different through flavor, aroma, visual cues and/or textural differences.

Aroma Identification – Participants will be asked to identify five different aromas from vials provided. A list of potential aromas will be provided.

Aromas		
Cinnamon	Cherry	Strawberry
Chocolate	Butter	Licorice (anise)
Maple	Coffee	Peach
Oregano	Grape	Onion
Basil	Garlic	Raspberry
Lemon	Peppermint	Sage
Lime	Clove	Watermelon
Orange	Nutmeg	Molasses
Vanilla	Ginger	Wintergreen
Apple	Banana	
Smoke	Coconut	

CUSTOMER INQUIRY – FOOD CONTAMINATION EXPLANATIONS

Each participant will be given a representative consumer inquiry received by a food processing company. After reading the inquiry, the participant must determine if the inquiry describes a food quality or food safety problem then indicate whether the nature of the problem is primarily biological, chemical, or physical.

Food Quality vs. Food Safety

Food Quality refers to the color, flavor, texture, and nutritional value of a food. When quality is compromised a food may: loose/change color, have less flavor, change in texture, and/or nutritional value may decline. Anything that causes a food to lose its appeal would be considered a "Food Quality" concern.

Food Safety refers to the possibility that an illness or injury may be caused by consuming a food. Anything in a food that would cause this would be considered a "Food Safety" concern.

Three Categories of Food Contamination

A contaminant is anything that can get into food that is not supposed to be there. Food contaminants fall into one of the three following categories:

1. **Biological** - Biological contaminants include bacterial, fungal, viral, and parasitic organisms and/or their toxins.
   Spoilage Bacteria – Bacteria that cause changes to the taste, texture, and/or odor of a food. They will not likely pose a risk of making someone sick. Pathogenic Bacteria – Bacteria that lead to food-borne illnesses. A few of the common bacteria in this class are: *E. coli, Listeria, Salmonella, Clostridium botulinum,* and *Staphylococcus aureus*.

2. **Chemical** - Naturally Occurring – Proteins associated with Allergens.
   Major allergens, which account for 90% of all food allergic reactions, are milk, egg, fish, crustacean shellfish, tree nuts, wheat, peanuts, and soybeans.
   Added – Pesticides, fertilizers, antibiotics, plant chemicals (cleaners, lubricants, sanitizers, adhesives, inks), and food additives (when they exceed legal levels)

3. **Physical** - Items that become part of the food from the natural environment or contaminated during processing/packaging. Common types of physical contaminants include metal, glass, plastic, wood, jewelry, insect parts, dirt, stones, hair, seeds, etc. A physical contaminant is a food safety hazard when is has the potential to cause injury to a consumer. Examples include choking, cut mouth, broken tooth.

EXAMPLE: Customer Inquiry Scenarios

Scenario A

Dear Company: I was enjoying one of your tv dinners and I found a small splinter of wood. I was glad that I didn't eat it! That would have hurt.

76. The situation in Scenario A can best describe as which of the following:
    - Food Safety Issue
    - Food Quality Issue `

77. Scenario A's concern or hazard can best be described as which of the following:
    - Biological
    - Chemical
    - Physical

Scenario B

Dear Company: I had purchased a bag of your potato chips the other day. All the chips were broken in the bottom of the bag. What a mess to eat.

78. The situation in Scenario B can best describe as which of the following:
    - Food Safety Issue
    - Food Quality Issue `

79. Scenario B's concern or hazard can best be described as which of the following:
    - Biological
    - Chemical
    - Physical

Scenario C

Dear Company: My wife bought a gallon of your milk the other day. When we opened it, it was already bad. The cap kind of popped off the top of the container and it smelled awful. We dumped it out.

80. The situation in Scenario C can best describe as which of the following:
    - Food Safety Issue
    - Food Quality Issue

81. Scenario C's concern or hazard can best be described as which of the following:
    - Biological
    - Chemical
    - Physical

Scenario D

Dear Company: I drank some of your egg nog and it was very tasty. However, about 4 hours later I had stomach cramps and spent the next several hours in the bathroom. I wanted to let you know the product code so no one
else gets sick.

82. The situation in Scenario D can best describe as which of the following:
    - Food Safety Issue
    - Food Quality Issue

83. Scenario D's concern or hazard can best be described as which of the following:
    - Biological
    - Chemical
    - Physical

Scenario E

Dear Company: This morning I opened up a package of your strawberry yogurt. It smelled different than usual, more like chlorine from a swimming pool. I tasted it any way, and sure enough it tasted just like it smelled.

84. The situation in Scenario E can best describe as which of the following:
    - Food Safety Issue
    - Food Quality Issue

85. Scenario E's concern or hazard can best be described as which of the following:
    - Biological
    - Chemical
    - Physical

FOOD SAFETY AND SANITATION PROBLEM IDENTIFICATION EXPLANATION

Updates Effective for 2014 Contest

Each participant will be shown 6 pictures. The pictures may or may not show a violation of good manufacturing practices (GMPs), sanitation, food handling/storage and other pre-requisite programs. A list of violation categories including the option of no violation will be provided. Participants will identify which category best describes each picture. If there is not a violation shown in the picture, the student will choose "no violation." *The category list has changed for 2014. Improper sanitation has been added as a category and safety hazard has been removed as a category.*

Good Manufacturing Practices (GMP's) are guidelines established by the FDA that are used to assure the safety, wholesomeness, and high quality standards for all food products manufactured, packaged, or stored in a facility. For a complete list of GMP's go to http://www.fda.gov/food/guidanceregulation/cgmp/default.htm and select full text of 21 CFR Part 110.

GMP Violation Categories

1. Improper personal hygiene
2. Improper sanitation
3. Improper food handling
4. Improper chemical use/storage
5. Improper pest management
6. No violation

**For 2014 Contest and beyond, Safety Hazard has been removed as a category and Improper Sanitation has been added.*

Examples of Categories

1. Improper Personal Hygiene

- All insecure jewelry (watches, earrings, necklaces, rings with stones) must not be worn to avoid the possibility that the object can fall into food, equipment, or containers.
- All employees should wear hair nets and beard covers (if applicable) to avoid contamination of food, food contact surfaces, and food packaging materials.
- Employees should wear appropriate clothing (uniforms, lab coats), as provided by the employer. Street clothes are not permitted.
- Workers with open cuts or wounds shall not handle foods or raw ingredients.

2. Improper Sanitation

- *Non-food contact surfaces (shelving, racks, and any item in the production area that does not directly touch food) shall be free from dirt and food debris and maintained in good repair.*
- *Food contact surfaces shall be free from dirt and food debris.*
- *All physical facilities (floors, walls, and ceilings) shall be maintained in good repair.*
- *All processing equipment and utensils shall be designed and of such material and workmanship as to be effectively cleanable, and shall be properly maintained.*
- *Processing areas shall be free from clutter, maintenance equipment and personal items.*
- *Processing and storage room floors should be designed to assure drainage of water during clean-up.*

3. **Improper Food Handling & Storage**
   - Employees that have direct contact with food should wear clean, impermeable sanitary gloves to avoid contaminating food.
   - Temperature must be properly controlled (at recommended temperatures) for both processing and storage of food. Fooda that require refrigeration shall be stored, transported, and received at 41 degrees Fahrenheit or below.
   - Food shall be stored at least 6 inches off the ground to prevent contamination. Pallets or racks may be used.
   - Processed foods shall not contain any foreign materials such as glass, metal, wood, or toxic substances.
   - Raw foods and ready-to-eat foods shall be stored in separated areas with proper identification.
   - *Canned food items shall be of good condition with no damage along the seams of the can.*

4. **Improper Chemical Use/Storage**
   - Chemicals, such as cleaning compounds, should be stored where there is not a risk for contamination of food, food contact surfaces, or food packaging materials.
   - Food and packaging materials should be put away or covered before cleaning/sanitation begins.
   - Chemical containers should be properly labeled with product name, composition, and safety information.
   - Employees handling cleaning chemicals should always wear personal protective equipment, including gloves and eye protection.

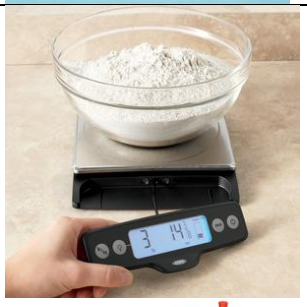
5. **Improper Pest Management**
   - Facilities, ingredients, packaging supplies, and processed foods shall be free of pests. This includes insects, rodents, birds, and any other domestic or wild animal.
   - Tall grass, weeds, and trash shall be cleared within several inches of the outside plant walls. These may harbor insects or rodents.
   - All outside doors and windows without screens must be kept closed. Holes in walls or window screens and cracks or spaces under doors or windows are not permitted. These precautions are necessary to limit the entry of insects or rodents.
   - Promptly cleaned up any food or garbage spills as they could attract pests.
   - Replace damaged or missing traps or bait stations.
   - *Dumpster lids should remain closed.*

Food Analysis Practicum Explanation *(New to contest in 2014)*

Background: Food products are analyzed for a variety of reasons including compliance with legal and labeling requirements, assessment of product quality, determination of nutritive value, detection of adulteration, and research and development. Sensory analysis is a method that is often used to guide the below parameters. Sensory analysis is often the ultimate test for the acceptance or rejection of a particular food product, however; there are a number of disadvantages: it is time consuming and expensive to carry out, tests are not objective, and it cannot be used to provide information about the safety, composition or nutritional value of a food. Ideally, a combination of analysis and sensory data would allow a manufacturer to set parameters that are measurable in a rapid method that ultimately relates to ensuring the overall liking of a product consistently. For these reasons objective analytical tests, which can be performed in a laboratory or on a process line using standardized equipment and procedures, are often preferred for testing food product properties that are related to specific sensory attributes.

Practicum: This practicum consists of six questions. The question may be a description of a product and an attribute that needs tested OR a picture of an instrument. Students will select the name of the instrument from the provided list. *For 2014 & 2015 the instrument list will contain the following:*

Instrument	Analysis	Picture Example of Instrument
pH meter	pH is the measurement of the acidity or alkalinity of a solution commonly measured on a scale of 0 to 14. pH 7 is considered neutral, with lower pH values being acidic and higher values being alkaline or caustic. pH is a commonly used analytical measurements in food processing.	
Texture Analyzer	Texture analyzers are machines that can press, pull, pierce, squash, twist and crush samples of food in a way which tries to mimic the end use as closely as possible. Texture analyzers measure food texture in a scientific, non-biased way that can be repeated to give standardized assessment methods. In many cases, these tests have been developed to try to mimic our senses to make the test as applicable to the product as possible, for example, to represent a biting action or a chewing action.	
Moisture Analyzer	Measures moisture content of foods. Moisture content affects physical and chemicals aspects of food which relate with freshness and stability during storage.	
Water Activity Meter	Water activity (a_w) is the measurement of available water in a food. Higher a_w substances (>0.85) support growth of bacteria.	

Brookfield Viscometer	Measures the viscosity (resistance of a material to flow) of liquid and semi-solids.	
Bostwick Constitometer	Measures consistency and flow rate of a viscous material such as sauces and salad dressings.	
Scale	Weight – can be measured off line as a periodic quality check or online so that every unit is measured.	 
Metal detector	Detect presence of metal contaminants.	
Colorimeter / Color Sorter	Color – Measurement of color in comparison to a standard. This can be used to maintain consistent baking, but it can also be used to ensure the purity of grains as they are processed (removes soy beans from wheat)	

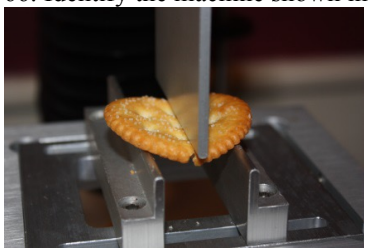
		  

EXAMPLE: Food Analysis Questions

Instrument List: pH Meter,Texture Analyzer, Moisture Analyzer, Water Activity Meter, Brookfield Viscometer, Bostwick Constitometer, Scale, Metal Detector, Colorimeter / Color Sorter

61. Our company is a maker of potato chips. We like all our chips to be a golden yellow color. What machine could help us in obtaining a consistent chip?
62. Our company makes carbonated beverages. The right acidity in our product ensures that it meets our customers flavor expectation each and every can they drink. How can I measure the acidity of the final beverage?
63. Our company processes fresh tomatoes to sell to both grocery stores as well as tomato canning operations. We wash and grade tomatoes based upon ripeness (redness) and size. Tomatoes that are a certain ripeness and specific size go to the grocery store everything else gets sent to the cannery. Is there equipment that could speed up my grading/sorting process?
64. Our company bakes cookies. The cookies we make are known for thier homemade appearance and flavor. To ensure they last to get to the consumer, we need to make sure they aren't too dry that they crumble, but they aren't so wet that they aren't cooked. What could I use to measure that?
65. Identify the machine shown in the following picture used to measure the flow rate of spaghetti sauce.

66. Identify the machine shown in the following picture used to measure how easily the cracker breaks.



IDEAS FOR PREPARING A PRACTICE AROMA KIT

Tasting can actually be just as helpful as smelling in many cases. You can always put the real food in some hot water, like Jell-O, Life Savers or Tootsie Rolls, and then just smell it. If seeing the items or colors is a problem, try blindfolding the kids. That could be really fun!

Here are some ideas:

- Baking section extracts and dried spices - almond extract, basil, ground cinnamon, clove, garlic powder, ground ginger, ground nutmeg, onion powder, oregano, peppermint extract, vanilla extract
- Lifesavers, Jolly Ranchers candies, Jell-O gelatin or pudding mixes- lemon, lime, grape, orange, strawberry, raspberry, wintergreen, peppermint
- Black licorice for licorice
- Cough drops for menthol
- Maple syrup for maple
- Molasses for molasses
- Peanut butter for peanut butter
- Pinesol for pine
- Buttered popcorn for butter
- Tootsie rolls for chocolate (this tastes most like what the aromas will smell like)

EXAMPLE OF PRODUCT DEVELOPMENT SCENARIO

TO: **Product Development Team**
FROM: **Marketing Research Team**
SUBJECT: **Snack Mix for Working Women**

Snack foods remain the fastest growing supermarket category with 21% growth over the last four years (Baking & Snack, March 2000). More Americans were snacking on granola bars, trail mixes, and other snacks in 2002- up 20% from 2001 (Food Technology, July 2003). Our marketing team has been researching current trends in the snack foods category, and we think that our company can benefit from entering the market with a new product- a snack mix.

Snack mixes are growing in popularity as more and more people seek variety and convenience. As a pretzel company, we already have the reputation of being a "healthier" snack than fried potato chips and corn chips. But pretzels can also get lost on the shelf compared to the exciting flavors of these other types of snacks. Mixing our pretzels into a snack mix can give us the best of both worlds.

We are interested in targeting the consumer with (1) the money to spend on this type of product; (2) willingness to try products that they believe will benefit them; and (3) a love of snacking. Our research indicates that women age 18-35 are a great match for this description. Women are interested in good nutrition, but are usually unwilling to give up good taste. Women are also more concerned with the benefits they can receive from a product rather than the biggest and flashiest product. (Page 2 gives more information about the target audience.)

Your job is to develop a snack mix containing pretzels using the information provided in this packet. You are responsible for making the formulation using the provided list of ingredient possibilities on page 6. You will need to calculate the cost using the information provided on page 5. You are also responsible for choosing the type of packaging and designing the label and calculating the nutrition facts for the label. (You need to name our product.) You will also need to write a summary that addresses the questions at the end of this packet.

Here is some key information you need to know:

- The distribution price will be set at $2.25 for 8 oz. product.
- The marketing department has set a ceiling of $1.60 for the ingredients and packaging of the product- this is the maximum that you as a product developer have to spend. You will need to calculate how much your choices of ingredients and packaging will cost in the final product.
- Your final product must weigh 8 oz.
- The serving size has been established at 1 oz.
- Your product must contain 3 oz. of pretzels and you must use at least 2 different shapes of pretzels.
- You must use one of the flavors (recommended use is 0.5 oz.)
- In addition to the pretzels and flavor you may use up to 4 other items.

EXAMPLE OF PRODUCT DEVELOPMENT SCENARIO CONT.

Target Audience

Here are some facts about your target audience to help you design your product to best meet their needs. Remember, your target audience is women age

18-35. It is difficult to imagine what another age group or gender likes. That's why it is important that companies use the market research information to help understand how to make products more appealing to them. Some of this information might be useful for you as you write your product summary.

- Women crave sweet foods 60% of the time and savory foods 40% of the time. (Science & Technology, Vol 80, No 1).

- Nearly half (44%) of all eating occasions for women 18-34 are snacks, and nearly 25% of their total calories per day come from snacks. (Prepared Foods, June 2003)

- 50% of all women are on a weight loss diet at any given time. One of the most popular current diet trends is the low carbohydrate/ high protein diet. (http://www.annecollins.com/eating-disorders/statistics.htm)

- 72% of Americans snack at least once a day, 69% try to make healthy snack choices, 30% consider fruit or vegetables their favorite snacks, 24% prefer chips or crackers (The Food Industry Newsletter, April 10, 2000)

- Over 25% of adult women snack one or more times per week in their car and 44% snack one or more times per week at work. (The Food Industry Newsletter, April 10, 2000)

- A growing number of women in the age group either live alone or are married with no children, therefore single-serve portions can be desirable (Prepared Foods, June 2003)

- A key characteristic in many of today's most successful new products is that they do a good job of satisfying more than one need or wish for today's time-pressured women. For example, portable, indulgent taste and low in calories all in the same product. (Prepared Foods, June 2003).

EXAMPLE OF PRODUCT DEVELOPMENT SCENARIO CONT.

Little extras to consider when designing your product…

Achieving a consistent seasoning application for any snack requires knowing many product and process parameters. Coating type and quantity, as well as product shape and fragility, all contribute to the finished product's quality. Generally, applying seasoning/oil-based slurries to snacks requires a rotating tumble-drum system. The amount of product tumbling and agitation is determined by the height, spacing and contour of flights. Typically, a seasoning powder adheres to a snack via surface oil, either from the fryer or a spray

A number of bold flavored cheese snacks have entered the market over the past year fueling the category's 4.4% growth in 2000. Frito-Lay's recently added several new flavors to its Rold Gold pretzel line, including bite-sized honey mustard and Parmesan herb flavors. Another new variety from Frito-Lay is Rold Gold Colossal Cheddar snack mix that includes pretzels. Dollar sales of pretzels declined 2.2% in 2000 to $1.19 billion. Pretzel manufacturers could grow their business by introducing new flavorful products and targeting emerging consumer groups.

Positive health news about snacks can have a positive impact on sales. A good example is snack nuts. A number of studies, including one conducted at Harvard School of Public Health and published November 14, 1998 in the *British Medical Journal*, have shown that consumption of peanuts and other nuts is associated with a lower risk of coronary heart disease. Other recent studies, including one conducted at Purdue University, have shown that snacking on peanuts leads to more eating satisfaction and subjects automatically adjust their diets to compensate for most of the additional calories. This news led to an 11.2% increase in pounds of snack nuts sold between 1998 and 1999. During 2000, snack nut sales increased 4.2% to reach 503.9 million pounds.

Reading Label Lingo
In addition to requiring that packaged foods contain a Nutrition Facts label, the FDA also regulates the use of phrases and terms used on the product packaging. Here's a list of common phrases you may see on your food packaging - and what they actually mean.

- No fat or fat free: Contains less than 1/2 gram of fat per serving
- Lower or reduced fat: Contains at least 25 percent less per serving than the reference food. (An example might be reduced fat cream cheese, which would have at least 25 percent less fat than original cream cheese.)
- Low fat: Contains less than 3 grams of fat per serving
- Sugar free: Contains less than 1/2 gram of sugar per serving
- Low sodium: contains less than 140 mgs of sodium per serving
- High fiber: 5 g or more per serving (Foods making high-fiber claims must meet the definition for low fat, or the level of total fat must appear next to the high-fiber claim)
- Good source of fiber: 2.5 g to 4.9 g. per serving
  http://www.foodproductdesign.com/archive/1997/0997DE.html
  http://www.ecrm-epps.com/Expose/V5_2/snacking.html

EXAMPLE OF PRODUCT DEVELOPMENT SCENARIO CONT.

Please answer the following in your written product summary…

- What words or images appear on your packaging to make it especially desirable for women age 18-35?
- Explain why you chose each of your ingredients- or why you didn't select some of the ingredients. (i.e., because of your target audience, processing factors, etc.)
- What considerations did you give to the nutritional needs of your target audience when choosing your ingredients?
- What is the most important physical characteristic of pretzels that allow them to stay safe during their relatively long shelf life?
- What are the ingredients in pretzels?
- Explain or draw a process flow chart of the steps in your pretzel manufacture and snack mix assembly. (Attach drawing to summary.)
- How will you add your flavor to your snack mix- in your pretzel dough or added as a coating? Why did you make this choice?
- How will you fill your packages- will you mix all your ingredients together first or add them to the bags at different times? What are advantages of the method you chose?
- How will you ensure the quality of your product- in other words, what aspects of your product will you need to test to be sure that your product is consistent?
- Which ingredient in your snack mix will cause the shelf life to decrease the most?
- What have you calculated as the ingredients/packaging portion of the final price? What other costs besides ingredients/packaging influence the distribution price that is set by the Marketing Team?

EXAMPLE OF PRODUCT DEVELOPMENT SCENARIO CONT.

ITEM UNIT	COST
PRETZELS	
Twists $0.06/oz	
Sticks $0.06/oz	
Nuggets $0.09/oz	
Rings $0.09/oz	
CRACKERS/PUFFS	
Crackers $0.08/oz	
Graham crackers	$0.08/oz
Popcorn $0.12/oz	
Corn puffs	$0.10/oz
NUTS	
Peanuts $0.25/oz	
Honey Roasted Peanuts	$0.30/oz
Cashews $0.35/oz	
FRUIT/CHOCOLATE	
Raisins $0.25/oz	
Dried cranberries	$0.35/oz
Candy-coated chocolate	$0.20/oz
SEASONING	
Honey $0.25/oz	
Cinnamon Sugar	$0.25/oz
Spicy BBQ	$0.25/oz
Cheddar Cheese	$0.25/oz
Ranch $0.25/oz	
Honey Mustard	$0.25/oz
PACKAGING	
8 oz. foil pouch	$0.05/package
8 oz. resealable foil pouch	$0.10/package
(8) 1 oz. foil pouches in a cardboard box	$0.15/package