SCIENCE OF THE SENSES: SENSORY EVALUATION IN THE CLASSROOM

UNIVERSITY OF GEORGIA COOPERATIVE EXTENSION
LET'S GET STARTED
2 lessons - 45 min or extended length, if desired

Lesson 1 - How Senses Influence Taste: A Look at Sensory Science
Lesson 2 - Diving into Sensory Science: Careers, Panels & Tests
RESOURCES FOR YOU

EACH LESSON HAS:

• Standards & Objectives
• Mini Lesson with Optional Videos
• Presentations
• Hands-on Activities
• Assessment and Extension Ideas
• Materials List
STANDARDS ADDRESSED

HUM-FS-2
Define food science and explore careers in food science.

- 2.3 Analyze how studying food science can benefit one in the future.
- 2.4 Evaluate and list careers in food science and list the educational requirements.
STANDARDS ADDRESSED

HUM-FS-3

Investigate how and why scientific evaluation of foods is conducted.

- 3.1 Identify physical, physicochemical, and chemical techniques used for assessing food quality.
- 3.2 Define sensory evaluation, identify the qualities that make-up the sensory characteristics of food, and explain how taste, aroma and the mouth feel sensations combined to give food their flavor.
STANDARDS ADDRESSED

HUM-FS-3
Investigate how and why scientific evaluation of foods is conducted.

- 3.3 Explain what sensory evaluation panels do and conduct a sensory panel using appropriate controls and quantify and analyze the data.
- 3.4 Describe the role of science in the development of new food products and the use of the scientific method.
WHAT IS SENSORY SCIENCE?

The scientific method used to evoke, measure, analyze, and interpret reactions to products that are perceived by the human sense.

ROLES

PRODUCT DEVELOPMENT

RESEARCH IN ACADEMIA

QUALITY ASSURANCE
HOW DO OUR SENSES WORK?
SENSES INVOLVED IN THE PERCEPTION OF FOOD

- Taste
- Texture
- Flavor
- Aroma
- Appearance
- Aftertaste

Senses Involved in the Perception of Food

- Taste
- Texture
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- Aroma
- Appearance
- Aftertaste
Appearance: Size, Shape, Color, or Surface Texture

Cheese: White, Yellow, Holey, Smooth
Texture: How food feels when placed on the surface of the tongue (mouth feel) and other parts of the skin

Cheese: Chewy, Crumbly, Dry, Moist, Waxy or Rigid
Aroma: The smell detected from a food

Cheese: Fruity, Mild, Tangy, Sweet, or Sharp
Hearing: the sound food makes when bitten or chewed

Cheese: Squeaky or Gummy
Taste: the sensation of flavor perceived by the mouth

Cheese: Mild. Smokey, Earthy or Nutty
WHAT IS TASTE?

Taste is a chemical sense perceived by specialized receptor cells on the tongue; it occurs when the receptor cells transmit information to the brain.
HOW DOES TASTE WORK?

There are five core taste:
- Sweet
- Sour
- Salty
- Bitter
- Umami
HOW DO WE TASTE?

Image:
http://library.thinkquest.org/05aug/00386/taste/fun/sweetandsour/sweetandsour.htm
HOW DO WE TASTE?

There are four type of papillae on the tongue:

- Foliate
- Fungiform
- Cicumvallate
- Filliform (does not have taste buds)

Image:
http://library.thinkquest.org/05aug/00386/taste/fun/sweetandsour/sweetandsour.htm
HOW DO WE TASTE?

Smells enter the olfactory through two routes.

1. Orthonasal olfaction—odors are first detected in the nasal cavity by sniffing or inhaling.

2. Retronasal olfaction—odors pass through in the back of the mouth and throat to the nasal and oral passages. This takes place during chewing, exhalation, and swallowing.

Source: https://sites.google.com/a/york.org/psych/5-sensation-and-perception/5-3-smell
HOW DO WE TASTE?

- What we actually "taste" is a combination of what is sensed in the nasal canal.
- Odors have increased sensitivity compared to taste.
- Thousands of smells are recognized compared to the five taste.
- Some people are more sensitive to certain odors than others.

Source: https://sites.google.com/a/york.org/psych/5-sensation-and-perception/5-3-smell
ACTIVITY BREAK!
APPLICATIONS WITHIN THE FOOD INDUSTRY

Using new ingredients or new suppliers
  Example: trying to use a new natural color for a "clean label"

Making store-brand versions
  Examples: generic cookies, chips, cereal

Examining shelf life or new packaging
  Example: determine "best by" dates by testing at 3-month intervals until something tastes stale or rancid
APPLICATIONS WITHIN THE FOOD INDUSTRY

Reducing fat, sugar, or salt
Examples: slow churned ice-cream, baked chips, reduced sodium soup

New flavors of existing products
Examples: new line-up of Diet Cokes, Pringles, Lay's Potato Chips

Completely new new products!

WHAT OTHER EXAMPLES CAN YOU THINK OF?
TYPES OF TASTE TEST PANELS
1. Trained Panels

- small group
- may be "supertasters"
- taught specific vocabulary
- used earlier in product development
- less about personal preference
- notice subtle differences

http://www.sensoryguidance.com/panels/
2. Consumer Panels

- larger group needed for statistics
- looking to capture the "average consumer" preference
- used later in product development
- helps predict success in market
BEST PRACTICES FOR PANELS MEAN LIMITING BIAS

Room Design
Controlled lighting, good ventilation, plain white walls, control flow of people
BEST PRACTICES FOR PANELS MEAN LIMITING BIAS

Individual judging
Single booths & instructions to remain quiet limit reactions from other panelists influencing others
BEST PRACTICES FOR PANELS MEAN LIMITING BIAS

Sample preparation

All samples should be the same temperature and volume, include palate cleansers (warm water, crackers, etc.)
BEST PRACTICES FOR PANELS MEAN LIMITING BIAS

Psychological bias

- Give samples random 3-digit codes
- Serve samples in counter-balanced order
- Limit number of samples (4-5 max)

=A=702

50% of panelists get AB

=B=961

50% of panelists get BA
TYPES OF TESTS

DISCRIMINATION
Are these products different?

CONSUMER ACCEPTABILITY/HEDONIC
Is this product acceptable? Which is preferred?

DESCRIPTIVE ANALYSIS
How are these products different?
DISCRIMINATION TESTS

- Need 25-50 panelists
- Do not require training
- Fast results
- Limited results (only give yes or no answers)
TRIANGLE TEST

Two are the same, one is different. Choose the odd sample.

187  750  929
A    A    B
TRIANGLE TEST
Two are the same, one is different. Choose the odd Oreo sample.

187  750  929

If the majority of subjects could not discriminate between samples, the reduced fat recipe was likely successful!
TRIANGLE TESTS

- 1/3 chance of correctly identifying the odd sample
- 2/3 chance of misidentifying the odd sample

If only 10 out of 30 panelists correctly identified the odd sample, that was likely only by chance.

This can be validated statistically.
ACTIVITY BREAK!
Triangle Test in Action
DUO-TRIO TEST
Which sample matches the reference (R)?

R
507 (A)
283 B
890 A
DUO-TRIO TEST

Which sample matches the reference (R)?

R

507  283  890

If the panelists cannot consistently match like samples, then the generic brand may be competitive with the name brand.
DESCRIPTIVE PANELS

- 8-12 panelists
- Training required for specific attributes (Aroma, Color, Texture, etc.)
- Time-consuming
- Detailed quantitative results
HOW ARE THESE PRODUCTS DIFFERENT?

Appearance: Orange Color

Light × Dark

Aroma: Sweet

Not at all × Very
The mark on the line can be measured with a ruler to give a numerical value for statistical analysis.
CONSUMER ACCEPTABILITY TESTS

- 75-150 untrained panelists
- Explores how much consumers like a product, preferences, etc.
- Can be hard to find a representative sample of people
- Helps predict success in market
PREFERENCE TEST
Do consumers prefer one over the other?
"Pepsi Challenge"

Which one do you prefer?
431  325  no preference

No preference should always be an option
HEDONIC TEST
Measures how much people like a product. Used to measure overall liking or a specific attribute like texture.

Sample 472 - overall liking

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Dislike Extremely | Neither like nor dislike | Like Extremely

OR

Sample 472 - flavor

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Dislike Extremely | Neither like nor dislike | Like Extremely
HEDONIC TEST

Measures how much people like a product

"Smiley Scales" are used for data collection with children or diverse groups who speak different languages.

Removing the labels from the faces makes it a more universal evaluation form.
Acceptability Test in Action
ACCEPTABILITY TESTS

Hedonic scales have numbers built in. Results are reported in words & numbers.

9  Like extremely
8  Like very much
7  Like moderately
6  Like slightly
5  Neither like nor dislike
4  Dislike slightly
3  Dislike moderately
2  Dislike very much
1  Dislike extremely

Average response of 8.1 could be equated with a product being "liked very much"
PUTTING IT ALL TOGETHER

1. Set out to make a healthier Cheetos.

2. Change recipe to reduce fat without losing flavor, bake instead of fry.

3. Perform a triangle test. Small statistical difference is found.
4. A descriptive panel shows how it's different - the new snack is crunchier.

5. Consumer acceptability testing shows if these differences are good or bad - new snack is preferred and is "liked very much"!
SENSORY CAREERS IN GEORGIA SNAP SHOT

https://www.bls.gov/oes/2017/may/oes191012.htm

https://www.youtube.com/watch?v=ejo5JXs_hDA
REFERENCES

REFERENCES


- "What Kind of Careers Do Food Scientists Have?" School of Food Science FAQs, School of Food Science: Washington State University and the University of Idaho, sfs.wsu.edu/prospective-students/faq/food-science-careers/.
THANK YOU!

QUESTIONS?

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