Food Science Program Self-Assessment

Student Evaluations

Like all courses at USU, students evaluate food science courses and instructors using the IDEA system. Each faculty member is encouraged to list at least three IDEA objectives on their syllabus, and these are the then scored by the students towards the end of the semester. The 2022 IDEA ratings for all Food Science Courses are listed below in Table 1.

Table 1: Summary of IDEA scores for food science faculty for courses taught in 2022*

Spring 2022	**Instructor**	**Progress on Objectives**	**Excellent Teacher**	**Excellent Course**
Sanitation and Safety	Nummer	Similar	Lower	Similar
Sensory Science	Martini	Higher	Similar	Similar
Food Analysis	Martarneh	Higher	Higher	Much Higher
Food Microbiology	Oberg	Similar	Similar	Similar
Dairy Processing	Sharma	Similar	Similar	Similar
Fall 2022	**Instructor**	**Progress on Objectives**	**Excellent Teacher**	**Excellent Course**
Chocolate Science	Martini	Similar	Similar	Similar
Food Chemistry	Ward	Similar	Similar	Similar
Meat Technology	Martarneh	Higher	Similar	Higher
Food Engineering	Bastarrachea	Higher	Higher	Higher
Food Laws	Savello	Higher	Higher	Higher
Product Development	Walsh	Similar	Higher	Higher

* ***Much Higher*** *represents top 10% of scores reported,* ***Higher*** *represents scores from 70-90%,* ***Similar*** *is the middle 40%,* ***Lower*** *is between 10% and 30%. Much Lower represents scores in the lowest 10% recorded.*

According to the table, 97% of the scores for *Progress on Objectives* were similar or higher than all scores reported to IDEA. For *Excellent Teacher*, 90% were similar and or higher. For Excellent Course, 100% were similar or higher than all scores reported to IDEA. *In all three categories our scores were improved from 2021.*

We do not have an *a priori* expectation for these evaluations, and as a program, we do not use the IDEA outcomes to drive decisions on our pedagogy. Junior faculty may use the information to document their teaching effectiveness for promotion and tenure purposes, and individual faculty discuss their instructor and course ratings with the department head during their yearly review. The primary reason this information is not used at the program level is that the ratings are subjective according to student experience and are not objective measures of performance.

Program Approval and Assessment for the Institute of Food Technologists

The Food Science BS program at Utah State University is an approved program by the *Institute of Food Technologists* (www.IFT.org). Globally, IFT sets guidelines for the background courses and curriculum to be covered in an approved food science program. USU received a new five-year approval by IFT in the Fall of 2019 which was based on a) *the appropriateness and expertise of the faculty*, b) *appropriate infrastructure including research and teaching laboratories*, and c) *a five-year assessment plan*. The food science program began to submit assessment reports to IFT in the fall of 2022. In this assessment

scheme, the overall curriculum of food science is broken down into 11 major areas, called **Standards**, which have associated **Essential Learning Outcomes (ELOs)** For the first 4 years, we will assess three ELOs across two Standards per year. In the fifth year, we will assess two ELOs across two Standards.

The ELOs were written and approved by the Higher Education Review Board (HERB) at IFT to facilitate assessment of learning objectives critical to the development of a capable food scientist. More specifically, the verbs used in the ELOs describe a learning outcome and suggest a cognitive domain level at which the ELO can be assessed. IFT has also advised approved programs to go beyond subjective student course evaluations and grades in assessing student learning and provided some examples of Learning Assessment Techniques (LATs). In 2021 and 2022 the food science faculty met to discuss implementing novel LATs for student evaluation. All food science programs are given flexibility in implementing the LATs and the first review of their appropriateness by the Higher Education Review Board (HERB) was conducted in the fall of 2022. As the IFT assessments are due in October of each year, the assessment we sent to them in October of 2022 reflected assessments collected in the fall of 2021 and spring of 2022. We anticipate receiving feedback in early 2023.

Results

The results are shown below. In 2021/2022 we assessed two standards (Sensory Science and Food Laws) and for each, there were three ELOs. Next, for each ELO, we used two different LATs. The results are presented in a table. The Standard, ELO, LATs, implementation, findings, and anticipated corrective actions are presented sequentially.

Standard	**Sensory Science**
ELO assessed	ELO 1: Apply experimental designs and statistical methods to sensory studies
Course(s) ELO was assessed in	NDFS 5100/6100: Sensory Evaluation of Foods
Period ELO was assessed	Spring 2021/Spring 2022
Exactly two different **Learning Assessment Techniques (LATs) used to assess above ELO**	1. Paper or project prospectus 2. Case study
Description of how each of the two LATs was implemented with students to assess ELO	LAT 1 was used in the form of a mid-term exam. Students had to identify a product from the local grocery store and identify a problem or situation that needed to be fixed in that product. Students would have to explain how they will solve that problem or situation and select an appropriate sensory technique (acceptance and discrimination test) to evaluate how the solution suggested affected the sensory properties of the product. Students would design the experiment, provide mock data for data collection, analyze the results using appropriate sensory techniques, and interpret the results obtained. LAT 2 was delivered as a final exam. Students are given a real-life situation and they have to choose the

	correct sensory technique to solve the problem presented. Students have to analyze data provided in the final exam using appropriate statistical techniques. Based on the results obtained, students would have to interpret the data.
Description of the tool(s) used for LAT analysis	LAT 1: Grading – 10 maximum allowed points LAT 2: Grading – 35 maximum allowed points
Key Findings for each of the two LATs	LAT 1: All students obtained maximum points LAT 2: 8 out of 10 students (80% of students) obtained above 31 points in the exam corresponding to approximately 90% of the maximum grade allowed (35 points)
Interpretation of key findings in connection to student learning	Students performed better when they can choose their own product and problem to resolve. This is perhaps because they chose the product and situation based on what they know and what they feel comfortable analyzing.
Description of anticipated actions for improvement of teaching and learning based on key findings	Incorporate more questions related to the use of appropriate statistical design will be incorporated in the quizzes and in the lab reports. These specific questions will be specifically used to evaluate the ELOs in future assessments.

Standard	**Sensory Science**
ELO assessed	ELO 2: Select sensory methodologies to solve specific problems in food
Course(s) ELO was assessed in	NDFS 5100/6100: Sensory Evaluation of Foods
Period ELO was assessed	Spring 2021/Spring 2022
Exactly two different Learning Assessment Techniques (LATs) used to assess above ELO	1. Paper or project prospectus 2. Case study
Description of how each of the two LATs was implemented with students to assess ELO	LAT 1 was used in the form of a mid-term exam. Students had to identify a product from the local grocery store and identify a problem or situation that needed to be fixed in that product. Students would have to explain how they will solve that problem or situation and select an appropriate sensory technique (acceptance and discrimination test) to evaluate how the solution suggested affected the sensory properties

	of the product. Students would design the experiment, provide mock data for data collection, analyze the results using appropriate sensory techniques, and interpret the results obtained. LAT 2 was delivered as a final exam. Students are given a real-life situation and they have to choose the correct sensory technique to solve the problem presented. Students have to analyze data provided in the final exam using appropriate statistical techniques. Based on the results obtained, students would have to interpret the data.
Description of the tool(s) used for LAT analysis	LAT 1: Grading – 10 maximum allowed points LAT 2: Grading – 35 maximum allowed points
Key Findings for each of the two LATs	LAT 1: All students obtained maximum points LAT 2: 8 out of 10 students (80% of students) obtained above 31 points in the exam corresponding to approximately 90% of the maximum grade allowed (35 points)
Interpretation of key findings in connection to student learning	Students performed better when they can choose their own product and problem to resolve. This is perhaps because they chose the product and situation based on what they know and what they feel comfortable analyzing.
Description of anticipated actions for improvement of teaching and learning based on key findings	Incorporate more questions related to the correct identification of appropriate sensory techniques will be incorporated in the quizzes and in the lab reports. These specific questions will be specifically used to evaluate the ELOs in future assessments.

Standard	**Sensory Science**
ELO assessed	ELO3: Discuss the physiological and psychological basis for sensory evaluation
Course(s) ELO was assessed in	NDFS 5100/6100: Sensory Evaluation of Foods
Period ELO was assessed	Spring 2021/Spring 2022
Exactly two different Learning Assessment Techniques (LATs) used to assess above ELO	1. Objective test items 2. Multiple-task mastery checklist

Description of how each of the two LATs was implemented with students to assess ELO	LAT 1 was used in the form of a quiz (Quiz 1: The senses). Students has to answer 25 questions (0.25 points each) to obtain a maximum of 5 points. Questions included multiple choice, true/false, and matching statements. In general, multiple choice questions had several correct options and points were subtracted for incorrect responses. Quizzes were taken on-line. Students had only one attempt to take the quiz and a maximum of 25 minutes was given to the students to complete the quiz. LAT 2 consisted on lab report. The Lab report used for this LAT was Lab 1: Sensory Adaptation/Factors influencing sensory perception
Description of the tool(s) used for LAT analysis	LAT 1: Grading – 5 maximum allowed points LAT 2: Grading – 5 maximum allowed points
Key Findings for each of the two LATs	LAT 1: 2/10 students obtained approximately 90% of the maximum grade. 3/10 students obtained between 80-90% of the maximum grade allowed and 5/10 students obtained between 70 and 80% of the maximum grade allowed. LAT 2:9/10 students obtained perfect grade in this assignment.
Interpretation of key findings in connection to student learning	Students performed better in LAT 2 which includes hand-on experiences and seem to be less successful at retaining factual information as assessed in LAT 1.
Description of anticipated actions for improvement of teaching and learning based on key findings	Incorporate more factual questions in the lab reports that will help students relate these factual concepts with the hands on experiments they perform in the laboratory.

Standard	**Food Laws & Regulations (FL)**
ELO assessed	IFT ELO1. Recall government regulatory frameworks required for the manufacture and sale of food products.
Course(s) ELO was assessed in	Food Laws & Regulations (NDFS 5510)
Period ELO was assessed	Fall 2021

Exactly two different **Learning Assessment Techniques (LATs) used to assess above ELO**	*LAT 1.* Homework analysis and writing answers to questions. *LAT 2*. Objective test items.
Description of how each of the two LATs was implemented with students to assess ELO	*LAT 1.* Analysis of *Federal Register* document series and synthesis writing of presented homework questions. Homework assignment to ten (10) students requiring in-depth reading of *Federal Register* documentation. Homework Module 1E presents the assigned *Federal Register* documentation and essay-style questions requiring written answers about reading content. *LAT 2:* Objective test items. Administered in mid-term examination questions to ten (10) students. Questions were administered to test student recall and understanding of the laws and regulations framework.
Description of the tool(s) used for LAT analysis	*LAT 1.* Homework analysis and writing answers to questions. Forty-five (45) total points. Each homework question has an assigned point value. Students receive the following guidance: *This assignment will be read, graded, and commented upon by the instructor on the bases of (a) depth, clarity, and logic of information presented, and (b) spelling, punctuation, and grammar of the written presentation.* *LAT 2.* Objective test items. Each mid-term examination question has a two (2)-point value.
Key Findings for each of the two LATs	*LAT 1.* 8/10 (80%) students scored 45 points. 1/10 student scored 42 points. 1/10 student scored 34 points. *LAT 2.* Q3 analysis. 9/10 (90%) students scored 2 points. 1/10 student scored 1 point. Q11 analysis. 10/10 (100% students scored 2 points. Q14 analysis. 8/10 (80%) students scored 2 points. 2/10 students scored 0. Q30 analysis. 8/10 (80%) students scored 2 points. 2/10 students scored 0. Q43 analysis. 10/10 (100%) students scored 2 points. Q45 analysis. 9/10 (90%) scored 2 points. 1/10 scored 0. Q46 analysis. 10/10 (100%) students scored 2 points. Q48 analysis. 7/10 (70%) students scored 2 points. 3/10 students scored 0.

	Q52 analysis. 10/10 (100%) students scored 2 points.
Interpretation of key findings in connection to student learning	*LAT 1.* 9/10 students scored in the "A" range indicating that ELO1 was successful by having students analyze and write critical short-essay answers. *LAT 2.* The overall score of ten (10) students answering the mid-term examination objective nine (9) questions related to ELO1 was 163/180 points (91%).
Description of anticipated actions for improvement of teaching and learning based on key findings	The two forms of having students read, analyze, and answer homework and mid-term examination questions met ELO1 as a high number of students successfully recalled and presented written materials about food regulatory documents and frameworks.

Standard	**Food Laws & Regulations (FL)**
ELO assessed	IFT ELO2. Describe the processes involved in formulating food policy
Course(s) ELO was assessed in	Food Laws & Regulations (NDFS 5510)
Period ELO was assessed	Fall 2021
Exactly two different Learning Assessment Techniques (LATs) used to assess above ELO	*LAT 1.* Homework analysis and writing answers to questions; Open-ended essay. *LAT 2*. Open-ended essay.
Description of how each of the two LATs was implemented with students to assess ELO	*LAT 1:* (Homework analysis and writing answers to questions; Open-ended essay) Homework Module 3E Questions 1-3 (link) is a homework assignment to group of ten (10) students that requires the reading of a D.C. Circuit federal court legal opinion *Pearson v. Shalala* and, in an open-essay format, answering questions about the legal opinion. This exercises exposes the students to legal reasoning by a federal court of a federal law and/or regulation. *LAT 2.* (Open-ended essay). Homework assignment requiring in-depth reading of *Federal Register* documentation. Homework Module 3E Question 4 (link) presents the assigned *Federal Register* documentation and essay-style questions requiring

	written answers about the method by which a *Federal Register* publication requests input ("comments") by the public. This presents to students the methodology by which input can help form an eventual *Final Rule* and subsequent publication in the *CFR*.
Description of the tool(s) used for LAT analysis	*LAT 1.* (Homework analysis and writing questions; Open-ended essay) Question 1-3 of Module 3E each has a value of 3 points. Questions 1-3 have a total value of nine (9) points. Students receive the following guidance in answering the three (3) questions: *This assignment will be read, graded, and commented upon by the instructor on the bases of (a) depth, clarity, and logic of information presented, and (b) spelling, punctuation, and grammar of the written presentation.* *LAT 2.* (Open-ended essay) Question 4 of Module 3E has eight (8) parts, each worth three (3) points. This Question 4 has a total value of 24 points. *This assignment will be read, graded, and commented upon by the instructor on the bases of (a) depth, clarity, and logic of information presented, and (b) spelling, punctuation, and grammar of the written presentation.*
Key Findings for each of the two LATs	*LAT 1. 9*/10 students scored nine (9) points. 1/10 student scored 8 points resulting from one missing element of Question 2 (worth one point). Group/class average scored 98.9%. *LAT 2.* 8/10 students scored 24 points. 1/10 student scored 21 points resulting from insufficient justification for position taken in Part 4E. 1/10 student scored 18 points resultin from insufficient justification for position taken in Part 4G and Part 4H. Group/class average scored 96.3%.
Interpretation of key findings in connection to student learning	*LAT 1.* 9/10 students scored in the "A" range and one student scored in "B" range indicating that ELO2 was successful by having students analyze and write critical short-essay answers. *LAT 2.* The overall score of ten (10) students answering the eight (8) questions related to ELO2 was 231/240 points (96.3%) indicating a successful reading, analyzing, and writing open-ended essays in such manner to be acceptable comments to the *Federal Register*.

Description of anticipated actions for improvement of teaching and learning based on key findings	The two (2) forms of having students read and analyze judicial opinions and *Federal Register* documentation, and answer related homework questions meet ELO2 as a high number of students successfully presented open-ended essays about legal reasoning of food laws/regulations and sufficiently robust answers to questions (as "comments) posed in the *Federal Register.*

Standard	**Food Laws & Regulations (FL)**
ELO assessed	IFT ELO3. Locate sources of food laws and regulations
Course(s) ELO was assessed in	Food Laws & Regulations (NDFS 5510)
Period ELO was assessed	Fall 2021
Exactly two different Learning Assessment Techniques (LATs) used to assess above ELO	*LAT 1.* Objective test items. *LAT 2*. Homework analysis and writing answers to questions.
Description of how each of the two LATs was implemented with students to assess ELO	*LAT 1.* (Objective test items). Administered in mid-term examination questions to group of ten (10) students. Appendix 2. IFT 3. LAT 1. SAMPLE MID-TERM EXAMINATION EXERCISE 1. (link) presents questions that test students of their locating source of, interpreting same, and answering specific questions about a Final Rule in the *Federal Register.* *LAT 2:* (Homework analysis and writing answers to questions). Homework Module 2E (link) is a homework assignment to group of ten (10) students that requires the location of a specific CFR source information followed by analyses of two (2) sample **Nutrition Facts** boxes and calculating the missing values using the CFR source information. Question also requires the students provide a "Regulatory Reason" for respective answers.
Description of the tool(s) used for LAT analysis	*LAT 1.* (Objective test items). Each of the nine (9) questions of Exercise 1 has a point value of one (1) point. Exercise 1 has a total point value of nine (9) points.

	LAT 2. (Homework analysis and writing answers to questions). The homework assignment has a total value of 12 points as indicated in Homework Module 2E (link).
Key Findings for each of the two LATs	*LAT 1.* (Objective test items). *9*/10 students scored 9 points. 1/10 student scored 8 points. Class average 98.9%. *LAT 2.* (Homework analysis and writing answers to questions). Students scoring 12/12 points – 7 Students scoring 11/12 points – 1 Students scoring 10/12 points -1 Students scoring 9/12 points – Class average 95.0%
Interpretation of key findings in connection to student learning	*LAT 1.* 9/10 students scored in the "A" range indicating that ELO3 was successful by having students locate source of, interpreting same, and answering questions about a Final Rule in the *Federal Register*. *LAT 2.* The overall score of ten (10) students answering the homework questions related to ELO3 was 114/120 points (95%). This indicates that the ELO3 and USU IDEA Student Learning Outcome were successfully met.
Description of anticipated actions for improvement of teaching and learning based on key findings	The two (2) forms of having students read, analyze, and answer mid-term examination and homework questions met ELO3 as a high number of students successfully searched for, found, interpreted, and answered questions about food regulatory documents and frameworks.

Our five-year assessment plan is presented below. In the fall of 2023, we will submit an assessment for the Standards Data and *Statistical Analysis* and also *Food Chemistry*.

Five Year Assessment plan

The USU Food Science 5-year assessment plan is shown in Appendix A. In the fall of 2022 the food science program will submit the first report of the new cycle to IFT.

Appendix A. Food Science Assessment Plan, 2020-2025

Year	Standard	Essential Learning Outcomes
2022	*Sensory Science*	
		• Apply experimental designs and statistical methods to sensory studies • Select sensory methodologies to solve specific problems in food • Discuss the physiological and psychological basis for sensory evaluation
	Food Laws and Regulations	
		• Recall government regulatory frameworks required for the manufacture and sale of food products • Describe the processes involved in formulating food policy • Locate sources of food laws and regulations
2023	*Data and Statistical Analysis*	
		• Use statistical principles in food science applications • Employ appropriate data collection and analysis technologies • Construct visual representation of data
	Food Chemistry	
		• Discuss the major chemical reactions that limit the shelf life of foods • Demonstrate laboratory techniques common to basic and applied food chemistry • Explain the principles behind analytical techniques associated with food
2024	*Food Microbiology*	
		• Identify relevant beneficial, pathogenic and spoilage microorganisms in foods and the conditions under which they grow • Describe the conditions under which relevant pathogens are commonly destroyed or controlled in foods • Discuss the role and significance of adaptation and environmental factors (e.g. water activity, pH, temperature) on growth response and inactivation of microorganisms in various environments
	Food Engineering and Processing	
		• Define principles of food engineering (mass and heat transfer, fluid flow, thermodynamics) • Explain the source and variability of raw food materials and their impact of food processing operations • Use unit operations to produce a given food product in a laboratory or pilot plant
2025	*Critical Thinking and Problem Solving*	
		• Apply critical thinking skills to solve problems • Select appropriate analytical techniques when presented with a practical problem • Evaluate scientific information
	Food Science Communication	
		• Write relevant technical documents related to food science • Deliver oral presentations related to food science • Assemble food science information for a variety of audiences
2026	*Professionalism and Leadership*	

	• Demonstrate the ability to work independently and in teams • Discuss examples of ethical issues in food science
Quality Assurance	
	• Define food quality and safety terms • Apply principles of quality assurance and control
Food Safety	
	• Identify potential hazards and food safety issues in specific foods • Discuss methods for controlling physical, chemical and biological hazards

Table 2. Standards and Essential Learning Outcomes assessed in 2021/2011.

Year	Standard	Essential Learning Outcomes
Submission Year 2022	*Sensory Science*	
		• Apply experimental designs and statistical methods to sensory studies • Select sensory methodologies to solve specific problems in food • Discuss the physiological and psychological basis for sensory evaluation
	Food Laws and Regulations	
		• Recall government regulatory frameworks required for the manufacture and sale of food products • Describe the processes involved in formulating food policy • Locate sources of food laws and regulations