ASSESSMENT REPORT 2015-2016

Food Science, BS

The undergraduate B.S. in food science is housed in the Department of Poultry Science. The food science B.S. degree is designed to prepare students for careers in the food industry or admission into graduate programs in food science. During the 2015-16 academic year, 20 undergraduate students were enrolled in the food science program.

Student Learning Outcomes

1. **Specificity of Outcomes**

SLO 1: Food Sources - Students will know the sources of food-related substances.

SLO 2: Food Ingredients - Students will be able to explain the functionality and interactions of food ingredients within a food system.

SLO 3: Chemical Stability - Students will be able to describe the chemical stability of food.

SLO 4: Food Safety - Students will recognize food safety risks associated with food.

SLO 5: Food Plant Sanitation - Students will be able to explain the fundamental principles of food plant sanitation as applied to the food industry.

SLO 6: Food Analysis - Students will be able to determine and describe methodologies for food chemical and physical analysis.

SLO 7: HACCP - Students will be able to design a hazard analysis critical control point (HACCP) plan.

SLO 8: Microbial Food Stability - Students will be able to describe microbial stability of food.

SLO 9: Microbiological Analysis - Students will be able to perform microbiological analyses of foods.

SLO 10: Sensory Science - Students will be able to explain sensory science's role within food product development and methods associated with sensory evaluation.

SLO 11: Food Processing - Students will demonstrate an understanding of food processing methods.

SLO 12: Food Engineering - Students will demonstrate a knowledge of the engineering concepts and principles associated with food processing.

SLO 13: Food Product Development - Students will be able to conceptualize and develop a new food product, thereby demonstrating an understanding of the food product development process.

SLO 14: Communication - Students will demonstrate effective oral and written communication skills.

SLO 15: Problem Solving - Students will be able to solve food science-related questions/problems.

SLO 16: Professionalism - Students will interact and communicate professionally with people in the food science industry.

2. **Comprehensive Outcomes**

For the B.S. in food science, the above outcomes are comprehensive. Our professional organization, the Institute of Food Technologists (IFT), lists numerous competencies that food science students must have for a food science program to receive their endorsement (our program is approved by IFT). Food science courses and SLOs were developed based on the IFT guidelines. Reports are submitted annually to IFT.

3. **Communicating Outcomes**

The outcomes listed above have been distributed to faculty via email and discussed at faculty meetings.

Curriculum Map

4. SLOs are assessed in at least one course as indicated by the curriculum map below.

	FDSC 1000	FDSC 4290	FDSC 4920	FDSC 5430	FDSC 5450	FDSC 5640	FDSC 5660	FDSC 5730	FDSC 5770	POUL 5140	POUL 5160	BSEN 5550
SLO 1: Food Sources	1	0	V	2	0	1	1	0	0	0	0	0
SLO 2: Food Ingredients	1	0	V	2	1	2	0	1	1	2	0	0
SLO 3: Chemical Stability	1	0	V	2	1	1	0	0	0	1	0	0
SLO 4: Food Safety	1	0	V	0	1	1	2	1	2	1	2	0
SLO 5: Food Plant Sanitation	0	0	V	0	1	0	0	0	2	0	0	0
SLO 6: Food Analysis	0	0	V	0	2	1	0	1	0	2	0	0
SLO 7: HACCP	1	0	V	0	0	1	0	0	2	0	2	0
SLO 8: Microbial Food Stability	1	0	V	0	1	1	2	1	1	1	0	1
SLO 9: Microbiological Analysis	0	0	V	0	1	1	2	1	1	0	1	0
SLO 10: Sensory Science	0	0	V	0	0	2	0	2	0	1	0	0
SLO 11: Food Processing	1	0	V	0	0	1	0	1	1	2	0	2
SLO 12: Food Engineering	0	0	V	1	0	1	0	0	1	0	0	2
SLO 13: Food Product Development	0	0	V	1	1	2	1	1	0	2	0	0
SLO 14: Communication	1	2	2	2	1	2	2	2	1	2	1	2
SLO 15: Problem Solving	1	1	2	2	2	2	2	1	1	2	1	2
SLO 16: Professionalism	1	1	2	1	1	1	1	1	1	2	1	1

0 = no coverage; 1 = some coverage; 2 = extensive coverage; V = variable depending upon internship experience

Measurement

5. **Outcome-Measure Alignment**

Most SLOs are assessed using a combination of a pre-test/post-test, specific exam questions, or class assignments. Several rubrics have been developed to help with assessing class assignments (e.g., written communication, oral communication, projects). Item 1 shows an example of a pre-test used in FDSC 1000. Items 2-4 are rubrics used for assessing communication ability. Item 5 is a survey used by internship supervisors to assess our students.

6. **Direct Measures**

Each SLO has a direct measurement.

7. **Data Collection**

For some SLOs, individual faculty members collect data for their courses, usually in the form of pre-test/post-test results. The pre-test consists of a series of questions administered in class at the beginning of the semester. The same questions are re-administered later in the semester (either as exam questions, an end-of-the-semester post-test, or part of the final exam). Number of correct responses to both the pre-test and post-test on a question by question basis are reviewed by the faculty member and reported to the assessment coordinator.

Communication skills are assessed throughout the student's program, starting with the introductory course. Rubrics are used to assess both written and oral communication skills. The faculty member completes the rubric, which is returned to the student to hopefully improve their future performance. All scores are reported to the assessment coordinator at the end of the semester.

Class projects also assess students' abilities in FDSC 5640, POUL 5140/ANSC 4700, and POUL 5160. A rubric is used to help identify areas where students' performance needs improving.

All food science students complete an internship most commonly in the food industry. The on-site supervisor completes a performance evaluation form on the student. The survey is provided as a google document which is completed online. The evaluation is completed at mid-semester with results reported to the student. A final evaluation is completed at the end of the semester.

Item 1. Evaluation tool used in FDSC 1000 to assess SLO 1.

FDSC 1000 Pre-test (Food Sources) **Major:** Food Science____ Name _____

Non-Food Sci ____

Circle the one correct answer.

1. Amylose and amylopectin are found in _____.

   A. yogurt B. wheat C. beef D. olive oil

2. Which of the following is found in canola oil?

   A. cholesterol B. free fatty acids C. triglycerides D. all the above

3. What food would contain casein?

   A. cranberries B. cheese C. wheat bread D. clarified butter

4. Fructose is found in _____.

   A. milk B. oranges C. potatoes D. spinach

5. The greatest amounts of trans fat are found in _____.

   A. stick margarine B. tub margarine C. stick butter D. liquid oil

6. The sugar in the typical sugar bowl at home is called: _____.

   A. glucose B. fructose C. lactose D. sucrose

7. The unique structure of wheat bread comes from its _____ content.

   A. amylose B. cellulose C. gluten D. carrageenan

8. Strawberries contain:

   A. gelatin B. β-carotene C. cholesterol D. anthocyanins

9. Lecithin is found in:

   A. hamburger B. egg yolk C. spinach D. whipped cream

10. Lysine, alanine, and tryptophan are most abundant in a 50-gram sample of:

    A. apples B. olive oil C. skim milk D. beef jerky

Item 2. Evaluation tool used in POUL 5160 to assess SLO 7.

Written HACCP Plan Rubric (POUL 5160)

	1 - Undeveloped	3 – In Development	5 - Developed
Product and process description	Team did not prepare a flow diagram or product description.	Team prepared a flow diagram, but it was incomplete; steps were missing or incorrect. The product description was incomplete.	Team prepared a complete and easy to follow flow diagram. The product description was thorough and engaging.
Principle 1: Hazard Analysis	Did NOT identify a list of potential food safety hazards. Team members did NOT specifically address any of the 3 categories.	Identified some of the potential food safety hazards for their product and/or incorrectly identified a hazard.	Identified potential food safety hazards as necessary for their product.
Principle 2: CCPs; and Principle 3: Critical Limit	Identified NO Critical Control Points. Identified NO critical limits for the critical control points, or CL identified were incorrect.	Identified some of the Critical Control Points. Identified critical limits for MOST, but not all of the critical control points that they mentioned, or some CLs were incorrect.	Identified all of the product/process Critical Control Points. Identified correct critical limits for EACH critical control point that they mentioned.
Principle 4: Monitoring Requirements	Did NOT describe the monitoring procedures for critical control points.	Vaguely described how the critical control points would be monitored. Frequency of monitoring was NOT addressed.	Described the frequency of monitoring requirements, and briefly explained how the critical control points would be monitored.
Principle 5: Corrective Actions	Team did NOT describe corrective actions.	Team described corrective actions that to be taken when critical limits are NOT met. Most, but not all of the critical limits were addressed.	Team described corrective actions that would be taken to be taken when critical limits are NOT met. ALL critical limits were addressed.
Principle 6: Verification procedures	Team did NOT describe procedures to ensure the HACCP system is working as intended.	Team described some procedures to ensure the HACCP system is working as intended.	Team THOROUGHLY described procedures to ensure the HACCP system is working as intended.
Principle 7: Record Keeping	Team addressed NONE of the following types of records: 1. monitoring of critical control points, 2. critical limits, 3. verification activities, and 4. the handling of processing deviations.	Team addressed 1 or 2 of the following types of records: 1. monitoring of critical control points, 2. critical limits, 3. verification activities, and 4. the handling of processing deviations.	Team addressed 3 or 4 of the following types of records: 1. monitoring of critical control points, 2. critical limits, 3. verification activities, and 4. the handling of processing deviations.
Mechanics	Numerous and distracting errors in sentence structure and word usage	Many errors in punctuation, capitalization and spelling.	No errors in punctuation, capitalization and spelling.
Sample logs/records	Plan did not include sample logs	Sample logs were included but were missing some information	Sample logs were included and had all pertinent information
Peer review	Team members gave individual an average rating <50%	Team members gave individual an average rating of 70-80%	Team members gave individual an average rating of 90-100%

Item 3. Evaluation tool used to assess writing ability (SLO 14).

Food Science Written Laboratory Report Rubric

Report Component	Evaluation Criteria				
	Developed	In Development		Not Developed	
	Excellent	Good	Acceptable	Fair	Poor
Introduction (10 points)	Introduces the research topic using scientific literature. Importance and justification clearly explained. Research objective or hypothesis presented clearly. (10)	Introduces the research topic using scientific literature. Importance and justification less clearly explained. Research objective or hypothesis presented clearly. (8-9)	Introduces the research topic, but with less literature. Importance and justification less clearly explained. Research objective or hypothesis presented, but not clearly. (7)	No literature in introduction. Importance and justification weakly explained. Objective or hypothesis poorly presented. (6)	No literature in introduction. Importance and justification poorly explained. Objective or hypothesis lacking. (0-5)
Methodology (10 points)	Research methods complete, clear, and thoroughly explained. (10)	Research methods less clearly written, but complete. (8-9)	Research methods less clearly written. Some minor components missing. (7)	Methods written in a confusing manor; components missing. (6)	Inaccurate or incomplete methods. (0-5)
Results and Discussion (20 points)	Results presented clearly; discussion explains results correctly & relates to literature; scientific errors are explained; unsolved problems addressed. (19-20)	Results presented clearly; discussion explains most results correctly & relates to literature; scientific errors are explained; unsolved problems addressed. (16-18)	Results complete but not presented clearly; discussion explains most results correctly & relates to literature; scientific errors and unsolved problems weakly addressed. (14-15)	Results incomplete and not presented clearly; some results discussed correctly; little relation to literature; scientific errors or unsolved problems not addressed. (12-13)	Results incomplete and poorly presented; discussion does not explain results correctly; no relation to literature; scientific errors and unsolved problems not addressed. (0-11)
Data Analysis (20 points)	Calculations are correct; Tables and graphs correctly prepared and explained. (19-20)	Calculations are correct; Tables and graphs prepared correctly, but explanation is weak. (16-18)	Calculations are correct; tables and graphs contain minor errors with weak explanation. (14-15)	Some incorrect calculations; tables and graphs contain errors; explanation weak. (12-13)	Many incorrect calculations, tables and graphs poorly or incorrectly prepared without explanation. (0-11)
Conclusion (10 points)	Accurately summarizes and closes the report. (10)	Summarizes paper adequately but somewhat simplistically. (8-9)	Weak and simplistic closing. (7)	Much verbatim text from introduction and main body. (6)	Uses introduction as conclusion; strays off topic; does not close the paper. (0-5)
Organization (10 points)	Reference format in reference list and in-text followed correctly; topic and transitional sentences included in paragraphs. (10)	Organization good; some transitions lacking; flow generally good. Proper reference format. (8-9)	Weak introductory sentences to paragraphs; paragraph transitions lacking. Inconsistent reference format. (7)	Organization needs much work; no introductory sentences or transitions. Random ideas without clear linkage. Some references missing. (6)	No organization at all; incoherent random ideas without direction. No references. (0-5)
Grammatical Correctness (20 points)	No errors in punctuation, spelling, verb-noun agreement. No comma splices. No slang nor contractions. (20)	Minimal (1-3) grammar errors. (16-19)	Four to five grammar errors. (14-15)	Six to eight grammar errors. (12-13)	More than 8 grammar errors. (0-11)

Item 4. Evaluation tool used to assess oral communication ability (SLO 14) in FDSC 4920.

Internship Oral Presentation Rubric – FDSC 4920

Presentation Component	Evaluation Criteria				
	Developed	In Development		Not Developed	
	Excellent	Good	Acceptable	Fair	Poor
Presentation Style (20 points)	Sophisticated word choice; audible; smooth delivery; clearly articulated; no distracting mannerisms; consistent eye contact with audience; audience interest maintained (18-20)	Sophisticated word choice; audible; less smooth delivery; less clearly articulated; no distracting mannerisms; inconsistent eye contact with audience; audience interest maintained (16-17)	Simple word choice; less audible; less smooth delivery; less clearly articulated; few distracting mannerisms; inconsistent eye contact with audience; audience interest maintained (14-15)	Simple word choice; inaudible at times; rough delivery; not clearly articulated; distracting mannerisms; inconsistent eye contact with audience; audience interest not maintained (12-13)	Inappropriate word choice; inaudible; rough delivery; poorly articulated; distracting mannerisms; no eye contact with audience; audience interest not maintained (0-11)
Visual Aids (20 points)	Legible and professional; arranged in a logical order; organized; good technical detail; enhances understanding of subject (18-20)	Some print too small, but generally legible; professional; follows logical order; less organized; some technical details lacking; enhances understanding of subject (16-17)	Some print too small, but generally legible; less professional looking; order is less logical; less organized; some technical details lacking; enhances understanding of subject (14-15)	Many slides not legible; sloppy; contains some errors; order not logical; less organized; many technical details lacking; slide quality distracts from presentation (12-13)	Most slides not legible; sloppy; contains numerous errors; order not logical; poorly organized; many technical details lacking; slide quality distracts from presentation (0-11)
Company Info (50 points)	Company info thoroughly covered including history, locations, products made, customers, corporate structure; contains no errors or omissions. (45-50)	Info slightly less thoroughly covered. (40-44)	Few aspects missing, but generally complete. (35-39)	Many aspects missing. (30-34)	No company information provided. (0-29)
Internship Info (50 points)	Internship activities thoroughly covered; critique of company's strengths and weaknesses provided; contains no errors or omissions. (45-50)	Info slightly less thoroughly covered. (40-44)	Few aspects missing, but generally complete. (35-39)	Many aspects missing. (30-34)	No internship information provided. (0-29)
Ability to Answer Questions (10 points)	Questions related to the internship are able to be answered in depth. (10)	Most questions related to the internship are able to be answered in depth. (8-9)	Most questions related to the internship are able to be answered, but not in depth. (7)	Some questions related to the internship are able to be answered, but not in depth. (6)	No questions related to the internship are able to be answered. (5)
Total					

Item 5. Evaluation tool used by internship supervisors to assess SLO 14, 15, and 16.

	Always	Often	Sometimes	Infrequently	Never
Professionalism					
Intern models a professional appearance.					
Intern arrives punctually to work and meetings.					
Intern consistently demonstrates a professional attitude.					
Intern relates well with co-workers.					
Job Performance					
Intern demonstrates food science knowledge at a level appropriate for his/her training.					
Intern takes initiative.					
Intern demonstrates creativity.					
Intern completes tasks thoroughly.					
Intern follows through on assignments in a responsible and timely manner.					
Intern uses effective oral communication skills.					
Intern writes effectively.					
Intern demonstrates problem solving ability at a level appropriate for their academic training.					

Results

8. Reporting Results

A. Data from the pre-test/post-test for SLO 1 (food sources) are presented in the following table. Ratios are correct responses per total responses.

FDSC 1000 Assessment Results						
Food Composition/Source	2014-15		2015-16		Total (percent)	
Question #	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
1 - starch	4/9	9/9	1/5	4/5	35.7	92.9
2 - lipid	0/9	4/9	0/5	2/5	0.0	42.9
3 - casein	2/9	8/9	3/5	5/5	35.7	92.9
4 - fructose	4/9	7/9	2/5	3/5	42.9	71.4
5 - trans fat	0/9	4/9	1/5	3/5	7.1	50.0
6 - sucrose	4/9	7/9	2/5	4/5	42.9	78.6
7 - gluten	6/9	7/9	5/5	5/5	78.6	85.7
8 - anthocyanins	5/9	6/9	2/5	2/5	50.0	57.1
9 - lecithin	3/9	7/9	1/5	5/5	28.6	85.7
10 - amino acids	6/9	4/9	3/5	3/5	64.3	50.0
total	34/90	63/90	20/50	36/50		
	38%	70%	40%	72%	38.6%	70.7%

B. Data from the pre-test/post-test for SLO 2 (food ingredients) are presented in the following table. Ratios are correct responses per total responses.

FDSC 5430 Assessment Results	2013-14		2014-15		Total (percent)	
Food Ingredient Functionality	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
Question #						
11 - polysorbate	1/5	2/5	1/8	7/8	15.4	69.2
12 - antioxidants	0/5	3/5	3/8	8/8	23.1	84.6
13 - antimicrobial	1/5	4/5	4/8	5/8	38.5	69.2
14 - sweetener	1/5	1/5	1/8	0/8	15.4	7.7
15 - emulsifier	0/5	5/5	0/8	7/8	0.0	92.3
16 - starches	0/5	1/5	1/8	8/8	7.7	69.2
17 - hydrocolloids	1/5	5/5	3/8	8/8	30.8	100.0
18 - amylopectin	n/a	n/a	8/8	8/8	100.0	100.0
19 - emulsification	n/a	n/a	1/8	3/8	12.5	37.5
20 - leavening	n/a	n/a	0/8	6/8	0.0	75.0
total	4/35	21/35	22/80	60/80		
	11.4%	60.0%	27.5%	75.0%	22.6%	70.4%

C. Data from the pre-test/post-test for SLO 3 (chemical stability) are presented in the following table. Ratios are correct responses per total responses.

FDSC 5430 Assessment Results	2013-14		2014-15		Total (percent)	
Food Chemical Stability	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
Question #						
1 - mutarotation	2/5	4/5	1/8	8/8	23.1	92.3
2 - lipid oxidation	0/5	4/5	2/8	6/8	15.4	76.9
3 - Maillard reaction	3/5	3/5	4/8	4/8	53.8	53.8
4 - enzymatic browning	5/5	5/5	8/8	7/8	100.0	92.3
5 - amino acid protonation	1/5	2/5	1/8	4/8	15.4	46.2
6 - sucrose hydrolysis	0/5	3/5	4/8	7/8	30.8	76.9
7 - Maillard reaction	0/5	2/5	0/8	4/8	0.0	46.2
8 - amino acid protonation and Maillard	n/a	n/a	4/8	4/8	50.0	50.0
9 - lipid oxidation	n/a	n/a	3/8	7/8	37.5	87.5
10 - Maillard reaction	n/a	n/a	0/8	5/8	0.0	62.5
total	11/35	23/35	27/80	56/80		
	31.4%	65.7%	33.8%	70.0%	33.0%	68.7%

D. Data from the pre-test/post-test for SLO 4 (food safety) are presented in the following table. Ratios are correct responses per total responses.

FDSC 1000 Assessment Results						
Food Safety	2014-15		2015-16		Total (percent)	
Question #	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
11 - top pathogen	0/9	3/9	0/5	3/5	0.0	42.9
12 - cooking ground beef	2/9	2/9	1/5	3/5	21.4	35.7
13 - S. aureus	3/9	7/9	2/5	3/5	35.7	71.4
14 - Listeria	2/9	9/9	2/5	5/5	28.6	100.0
15 - Salmonella	9/9	9/9	5/5	5/5	100.0	100.0
16 - Vibrio	5/9	9/9	5/5	5/5	71.4	100.0
17 - botulism	2/9	8/9	2/5	5/5	28.6	92.9
18 - S. aureus	0/9	5/9	0/5	3/5	0.0	57.1
19 - Trichinella	5/9	9/9	0/5	5/5	35.7	100.0
20 - aflatoxin	2/9	6/9	1/5	3/5	21.4	64.3
total	30/90	67/90	18/50	40/50		
	33%	74%	36%	80%	34.3%	76.4%

E. Data for SLO 5 (food plant sanitation) are presented in the following table. Ratios are correct responses per total responses.

Food Plant Sanitation	2013-14		2015-16	
Question	Pre-test	Post-test	Pre-test	Post-test
1 - Meat Regulation	3/4	4/4	9/11	10/11
2 - Allergens	3/4	3/4	6/11	10/11
3 - Plant Inspections	1/4	2/4	2/11	5/11
4 - SSOP	2/4	4/4	2/11	7/11
5 - Recall	4/4	4/4	11/11	11/11
6 - HACCP	2/4	4/4	4/11	10/11
7 - Cleaning	1/4	0/4	4/11	8/11
8 - Sanitary Equipment	1/4	2/4	10/11	10/11
9 - GMP	3/4	4/4	6/11	9/11
10 - Cleaners	1/4	1/4	3/11	6/11
Total	21/40	28/40	57/110	86/110
	52.5%	70.0%	51.8%	78.2%

F. Data from the pre-test/post-test for SLO 6 (food analysis) are presented in the following table. Ratios are correct responses per total responses.

FDSC 5450		
Food Analysis	2014-15	
Question	Pre-test	Post-test
1 - Meat Regulation	7/8	8/8
2 - HPLC Calculation	3/8	3/8
3 - Acid in Yogurt	5/8	6/8
4 - Ash Calculation	4/8	4/8
5 - Fat Extraction	3/8	7/8
6 - Significant Figures	2/8	3/8
7 - Protein Analysis	1/8	5/8
8 - HPLC	2/8	8/8
9 - Fiber	3/8	5/8
10 - Spectrometry	1/8	5/8
Total	31/80	54/80
	38.8%	67.5%

G. Data for SLO 7 (HACCP) are presented in the following table. Food science, poultry science, and graduate students worked in teams to develop HACCP plans. Scores per category ranged from 1 (undeveloped skill) to 5 (fully developed skill).

Preparing a HACCP Plan 2015-16 Academic Year

Oral HACCP Presentation (due first)

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Average
Product and process description	4	5	5	5	4.5	5	4.75
Principle 1: Hazard Analysis	5	5	4.5	4	5	3.5	4.5
Principle 2: CCPs; and Principle 3: Critical Limit	5	5	5	5	4.5	4	4.75
Principle 4: Monitoring Requirements	4	4.5	4.5	5	5	4.5	4.58
Principle 5: Corrective Actions	4.5	5	5	5	5	4	4.75
Principle 6: Verification procedures	3	4.5	5	4.5	4	5	4.33
Principle 7: Record Keeping	4	5	4.5	4.5	5	5	4.67
Teamwork	5	5	5	5	5	5	5
Visual aids	4	4.5	5	5	4.5	4	4.5
Delivery	4	4.5	5	5	5	5	4.75

Written HACCP Plan (due at semester's end)

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Average
Product and process description	5	4.5	4	4	5	5	4.58
Principle 1: Hazard Analysis	4.5	5	5	4	4	5	4.58
Principle 2: CCPs; and Principle 3: Critical Limit	5	5	5	4	5	4	4.67
Principle 4: Monitoring Requirements	4	4	4.5	5	5	4	4.42
Principle 5: Corrective Actions	5	4.5	4.5	4.5	5	5	4.75
Principle 6: Verification procedures	5	5	5	5	5	5	5
Principle 7: Record Keeping	5	5	5	5	3	5	4.67
Mechanics	4.5	4.5	4	4.5	4.5	5	4.5
Sample logs/records	5	5	5	5	5	5	5

H. Data for SLOs 8-11 have not been collected for the past two years as new faculty have taken over courses covering these SLOs.

I. Data based on specific exam questions that address SLO 12 (food engineering) are shown below. Percentage represents the average score on the particular subject matter from Fall 2015 (n = 11)

Problem solving skills (heat exchanger):	86.8%
Physical properties:	83.3%
Material and energy balance:	89.0%
Mechanisms of heat transfer:	87.3%

J. Data from the pre-test/post-test for SLO 13 (food product development) are presented in the following table. Ratios are correct responses per total responses.

Food Product Development					
		2013-14		2015-16	
Question	Topic	Pre-test	Post-test	Pre-test	Post-test
1	criteria of success	5/5	5/5	8/11	11/11
2	shelf life test	2/5	1/5	4/11	7/11
3	spoilage mechanism	4/5	5/5	5/11	8/11
4	criteria of new food product	5/5	5/5	8/11	11/11
5	protecting company customers	1/5	2/5	8/11	9/11
6	external corporate assistance	4/5	5/5	7/11	9/11
7	food service product development	0/5	0/5	2/11	5/11
8	evaluating consumer reaction to food	1/5	3/5	4/11	6/11
9	challenge of developing new ingredients	3/5	2/5	3/11	10/11
10	market research	2/5	4/5	0/11	5/11
	Total	27/50	32/50	49/110	81/110
		54%	64%	45%	74%

In addition, undergraduate and graduate students were divided into four groups for a semester-long product development project. Aspects associated with product development were assessed in a final report at the end of the semester. These are shown in the table below.

Attributes	Group 1	Group 2	Group 3	Group 4	Average
Demonstrated creativity in conceptualizing a new food product (15)	14	14	15	15	14.5
Integrated food ingredient chemistry concepts during the project (15)	13	15	15	15	14.5
Student demonstrated use of correct sensory methods during the project (10)	10	10	8	10	9.5
Student identified appropriate processing techniques necessary for the production of the food product (15)	14	14	14	15	14.3
Student analyzed packaging requirements based on product characteristics (10)	8	9	8	10	8.8
Student created a correct food product label (10)	8	10	10	10	9.5
Student approached problems during product development appropriately (15)	15	15	15	15	15.0
Student contributed to team meetings and helped maintain a positive team environment (10)	10	10	10	10	10.0

K. Feedback from internship supervisors was used to assess SLOs 14-16. The table below shows the results from summer 2015 (n = 8 students)

	Always	Often	Sometimes
Professionalism			
Intern models a professional appearance.	7 (88%)	1 (12%)	
Intern arrives punctually to work and meetings.	8 (100%)		
Intern consistently demonstrates a professional attitude.	8 (100%)		
Intern relates well with co-workers.	7 (88%)	1 (12%)	
Job Performance			
Intern demonstrates food science knowledge at a level appropriate for his/her training.	7 (88%)	1 (12%)	
Intern takes initiative.	7 (75%)	1 (12%)	1 (12%)
Intern demonstrates creativity.	5 (63%)	3 (37%)	
Intern completes tasks thoroughly.	7 (88%)	1 (12%)	
Intern follows through on assignments in a responsible and timely manner.	8 (100%)		
Intern communicates effectively.	5 (63%)	3 (37%)	
Intern demonstrates problem solving ability at a level appropriate for their academic training.	7 (88%)	1 (12%)	

L. Communication ability (SLO 14) was assessed across multiple courses.

1. Oral Communication

The tables below summarize oral communication data.

FDSC 4290 Professional Development in Food Science Oral presentation results (Spring 2015)

Student	Problem & justification (5)	Presented information (5)	Visual aids (5)	Spoke confidently (5)	Vocabulary & grammar (5)	Summary (5)	Response to question (5)	Handled difficult situations (5)	Leadership (5)
1	4.2	4.5	4.5	4.0	4.2	4.4	4.2	4.2	4.3
2	4.0	4.1	4.2	3.8	4.2	4.0	4.2	3.9	4.0
3	4.2	4.1	4.2	4.3	4.3	4.0	4.0	4.0	4.1
4	4.2	4.0	4.3	4.2	4.3	4.2	4.2	3.8	4.0
5	4.2	4.5	4.1	4.3	4.2	4.6	4.0	4.0	4.0
6	4.5	4.3	4.6	4.6	4.5	4.4	4.0	4.0	4.5
7	4.3	4.5	4.5	4.1	4.4	4.3	4.1	4.0	4.4
8	4.2	4.1	4.3	4.3	4.4	4.2	4.0	4.1	4.1
9	4.0	4.0	4.1	3.7	4.2	4.0	3.5	3.5	3.5
Average	84%	85%	86%	83%	86%	85%	80%	79%	82%

Food Chemistry Oral Report Summary

Criteria	2013-14 (n=5)	2014-15 (n=8)
word choice (0-4)	3	3.625
audience (0-4)	3.6	4
eye contact (0-4)	3.4	3.875
mannerisms (0-4)	3.4	3.5
clarity (0-4)	3.2	3.5
appropriate visual aids (0-4)	3.4	4
technical quality (0-4)	3.2	3.625
logical order (0-4)	4	4
legibility (0-4)	4	4
layout (0-4)	3.6	3.75
subject covered (0-30)	27.8	29.5
correct information (0-20)	20	20
answering questions (0-10)	7.8	9.5
total	90.4	96.9

Food Product Development (FDSC5640) Oral Presentation: Final Product

Student	Evaluation Component				
	Presentation Style (20 points)	Visual Aids (20 points)	Content (50 points)	Ability to Answer Questions (10 points)	Total
Group 1	20	19	47	9	95
Group 2	18	20	47	9	94
Group 3	20	19	48	8	95
Group 4	19	19	48	8	94
Average	19.3	19.3	47.5	8.5	94.5

2. Written Communication

The tables below summarize data from various writing assignments.

Sustainability Written Report Results (FDSC 1000 Spring 2015)

Student	Content A (10)	Content B (10)	Organization (5)	Grammar (10)
1	9	7	3	9
2	10	7	5	9
3	8	8	4	5
Average	90%	73%	80%	77%

Food Chemistry Writing Results (FDSC 5430 Spring 2015)

Student	Opening (5)	Body (20)	Closing (5)	References (5)	Grammar (15)
1	5	18	5	5	13
2	5	17	5	4	12
3	5	18	5	3	14
4	5	18	5	5	15
5	5	16	5	4	10
6	5	17	3	5	13
7	5	18	5	3	8
8	5	20	5	3	12
average	100%	89%	95%	80%	81%

Laboratory Report Grades - Microbiology of Meat (Fall 2015; n=7)

Report Component	1	2	3	4	5	6	7	8	9	10	11	12	average
Introduction (10)	7.00	6.88	7.00	6.43	6.86	6.71	7.17	6.86	6.57	6.83	6.29	6.14	6.73
Methodology (10)	8.25	8.25	9.57	8.86	8.71	8.71	9.17	9.43	9.00	8.83	8.57	9.00	8.86
Results and Discussion (20)	17.00	16.50	18.57	17.71	17.86	18.29	18.33	18.00	17.43	17.83	17.57	17.71	17.73
Data Analysis (20)	20.00	16.38	20.00	17.57	18.57	18.71	18.83	20.00	20.00	20.00	20.00	17.57	18.97
Conclusion (10)	8.50	8.00	8.57	8.29	8.43	8.71	8.33	9.14	8.14	8.17	8.29	8.00	8.38
Organization (10)	8.38	8.13	9.00	8.57	8.43	8.86	8.67	8.86	8.86	8.67	8.29	8.14	8.57
Grammatical Correctness (20)	17.00	16.88	17.71	17.29	17.71	19.29	19.83	18.86	19.57	19.83	19.86	19.71	18.63

FDSC 5640 - Food Product Development Written Reports (Sp 2016; n=11)

	paper 1	paper 2	paper 3	average
Introduction	99.1	97.3	98.2	98.2
Content of Main Body	93.1	95.8	93.8	94.2
Conclusion	86.4	94.5	91.8	90.9
Organization	91.8	94.5	92.7	93.0
Grammatical Correctness	96.8	98.6	98.2	97.9

The table below summarizes data from 2015 written internship reports. Each letter represents a different student.

	A	B	C	D	E	F	G	H	Average
Company info (out of 20)	18.00	14.00	20.00	19.00	20.00	18.00	17.00	18.00	**18.00**
Internship info (out of 15)	15.00	14.00	13.00	15.00	14.00	14.00	13.00	14.00	**14.00**
Grammar (out of 15)	13.00	12.00	15.00	13.00	9.00	4.00	2.00	7.00	**9.38**

M. Problem solving ability (SLO 15) was assessed across multiple courses and through internships. As an example, data for an exam question from FDSC 5430 involving using two graphs to answer a question appear below.

Problem solving involving interpretation of graphs
(FDSC 5430 - Spring 2015; n=8)

Problem Solving Steps	% Correct
understand glass transition graph	56
conversion of moisture contents	0
understand moisture sorption isotherm	50
explanation	44

Internship supervisors indicated that 7 out of 8 interns always used problem solving skills appropriate with their level (section 8. K.).

9. Interpreting Results

Student cohorts in food science are typically small, ranging from 5-11 students. The small sample size must be considered when interpreting the results discussed below.

A. SLO 1 – Food Sources

Students improved in their knowledge regarding sources of foods and food ingredients during FDSC 1000. However, the questions about lipids, trans fat, and amino acids received lower scores, indicating these topics should be covered more thoroughly in future course offerings.

B. SLO 2 – Food Ingredients

Students improved in their knowledge regarding the functioning of food ingredients during FDSC 5430. The scores increased from the 2013-14 cohort to the 2014-15 cohort. Questions about sweeteners (recognizing a carbohydrate) and emulsification received lower scores.

C. SLO 3 – Chemical Stability

Students improved in their knowledge regarding the food chemical stability during FDSC 5430. The scores slightly increased from the 2013-14 cohort to the 2014-15 cohort. Questions about amino acid protonation and the Maillard reaction received lower scores.

D. SLO 4 – Food Safety

Students improved in their knowledge regarding food safety during FDSC 1000. Questions about the top pathogen and cooking ground beef received the lowest scores; however, the scores on these questions were higher in 2015-16 than in 2014-15, indicating better topic coverage.

E. SLO 5 – Food Plant Sanitation

Data for SLO 5 show that students are gaining knowledge in the area of food plant sanitation. The most recent class displayed a larger increase in test scores (26.4 percentage points) in comparison to the earlier class (17.5 percentage points). However, two topics consistently received lower scores – plant inspections and cleaners.

F. SLO 6 – Food Analysis

Students in FDSC 5450 improved in their understanding of food analysis during the semester. Their weaknesses generally involved mathematics (HPLC calculations and significant figures).

G. SLO 7 – HACCP

Students in POUL 5160 successfully developed a HACCP plan. They were most proficient at creating sample logs and need the most improvement in outlining the monitoring requirements. Between the presentation and written plan, students improved their documentation of verification procedures.

H. SLOs 8-11

Between new faculty and irregular course offerings, these SLOs were not assessed.

I. SLO 12 – Food Engineering

Students were found to meet the food engineering student learning outcome as determined by their performance in BSEN 5550.

J. SLO 13 – Food Product Development

Data from the food product development pre-test/post-test indicate that the current cohort of food science students made larger gains in knowledge (25 percentage points) than the earlier cohort (10 percentage points). The consistent weakness is in the area of products developed for food service.

From the food product development capstone project, students demonstrated the integration of food science concepts. One area that was weaker than others involved analyzing packaging requirements for their food product.

K. SLO 14 – Communication Ability

Oral and written communication skills were evaluated across multiple courses as well as by internship supervisors. The internship supervisors noted food science students did not always use effective communication, however we could not decipher whether problems were with respect to written or oral communication.

In class, students are doing generally well with oral communication. In FDSC 5430, scores for the oral presentation improved from 2013-14 to 2014-15. As shown by scores from FDSC 4290, 5430, and 5640, one area students struggle with is the ability to answer questions following their presentation.

Written communication is more challenging for some food science students. Grammatical errors, inappropriate reference utilization, poorly constructed introductions, and weak conclusions are some of the issues needing improvement.

L. SLO 15 – Problem Solving

Food science students (7 out of 8) completing internships during 2015 were found by their supervisors to always solve problems at the expected level. However in class, problems involving graphs or mathematical concepts were more challenging and require additional practice.

M. SLO 16 – Professionalism

Feedback from internship supervisors indicated that 7 out of 8 food science students modeled professional behavior always while the remaining intern modeled it often. Thus, this SLO was successfully met.

10. Communicating Results

Results are shared with the faculty via email and discussed at faculty meetings. Rubrics for course assignments are shared with students to provide feedback for improving their performance.

Use of Results

11. Purposeful Reflection and Action Plan

Overall, assessment data show food science students are improving their knowledge with respect to each SLO. Within each SLO, sub-content areas have been identified needing attention. Each instructor is expected to modify course content or delivery to improve performance in these weaker areas.

The recent revision of our curriculum, where upper level food science courses were shifted to different semesters, will provide students with better pre-requisite flow upon which to build their food science knowledge.

To aid in determining where interns are lacking in terms of communication ability, the supervisor evaluation tool was modified to specifically ask about oral communication and written communication separately. The ePortfolio may be utilized in the future to give students additional writing practice.

One challenge is the incorporation and measurement of problem solving in courses across the curriculum. Specific problem solving exercises are being incorporated into FDSC 5430 to help better address SLO 15.

Additional discussions will occur prior to submitting our annual assessment report to the Institute of Food Technologists (mentioned in section 2).