

**Program Assessment Plan/Report
Undergraduate Program in Food Science
University of Arkansas
2015-2016**

1. Department Name & Contact Information

Department of Food Science

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2. Department Mission

The mission of the Department of Food Science is to serve as the primary source of higher education, fundamental and applied research, and public service associated with enhancing the wholesomeness, quality and availability of food, improving the health of Arkansas residents, and adding value to raw agricultural products with particular emphasis on products relevant to Arkansas. The Department of Food Science promotes programs for achieving regional, national and international recognition of excellence while contributing to the advancement of the quality of life and professional development for Arkansans.

3. Program Goals

Program Goal 1: Graduates can demonstrate and apply knowledge of the core competencies in food chemistry and analysis.

Outcome 1.1: Explains the chemistry involved in the properties and reactions of various foods and its components.

Outcome 1.2: Explains the principles behind analytical techniques associated with food and selects appropriate techniques.

Outcome 1.3: Expresses competence in ability and understanding of food chemistry and analysis methods.

Program Goal 2: Graduates understand and apply knowledge pertaining to the microbiology of relevant microorganisms in food systems.

Outcome 2.1: Identifies the causes of food spoilage and predicts the specific microorganisms that can spoil a given food when prepared, processed, and stored under given conditions.

Outcome 2.2: Identifies important pathogens, describes the conditions under which they grow, lists related detection techniques, and discusses methods for inactivation and control.

Outcome 2.3: Employs food preservation techniques to reduce and/or inhibit the growth of microorganisms.

Program Goal 3: Graduates are competent in both the principles and application of food processing and engineering concepts.

Outcome 3.1: Describes the principles and current practices of processing techniques and the effects of processing parameters on product quality.

Outcome 3.2: Applies principles of food processing and engineering to various food industry operations.

Program Goal 4: Graduates are able to apply the principles of Food Science to identify, define, and analyze technical problems and develop solutions to these problems.

Outcome 4.1: Applies the principles of Food Science to solve real-world situations and problems.

Outcome 4.2: Formulates effective solutions to technical problems related to the food industry.

Outcome 4.3: Critically evaluates reports/information related to food quantitative analytical skills including the application of statistical principles.

Outcome 4.4: Chooses appropriate sensory analysis techniques to address specific objectives.

Outcome 4.5: Understands government laws and regulations required for the manufacture and sale of food products.

Program Goal 5: Graduates have basic skills essential for employment.

Outcome 5.1: Works effectively independently as well as in a team setting.

Outcome 5.2: Appreciates the importance of and is committed to professional integrity and ethical values within the workplace.

Program Goal 6: Graduates are effective communicators.

Outcome 6.1: Writes clear and concise technical reports and research articles.

Outcome 6.2: Clearly communicates scientific principles and data to lay audiences.

4. Assessment Measures

Outcome 1.1: Explains the chemistry involved in the properties of and reactions of various foods and components

A. Assessment Measure 1.1

Student learning was assessed using pre-lab questions, formal lab reports and selected test questions at three levels of assessment including synthesis—see below.

FDSC 4304 and 4304L: Food Chemistry and Food Chemistry laboratory

1. Lectures and laboratory exercises containing the necessary knowledge to fulfill the outcomes rubrics were provided to students.

2. Students (n = 32) completed pre lab questions, formal lab reports and exam questions of knowledge and synthesis.

Direct Measures:

- A. Prelab questions are short answer questions asking for lists of parameters or factors and explanation of expected outcome. *Example: Why is Maillard browning important to food products? Which factors influence Maillard reaction? How can we speed up Maillard reactions?*
- B. Formal laboratory reports include a description of the activity, the results and an interpretation of the results, including speculation on causes of any possible unexpected results.
- C. Exams contain multiple choice, short answer as well as synthesis type questions where students are expected to recommend parameters to modify, improve or develop food products. *Example: Your boss has received a distraught call from one of your customers. The high protein, fructose sweetened energy drink you designed is turning brown after a few weeks shelf life. a) What do you think is causing this drink to turn brown? Explain, in general terms, the reactions that have taken place. What are 2 methods that you could use to minimize this reaction, including why these methods will work.*

Rubric 1.1

	Novice	Intermediate	Advanced	Expert
List factors that influence Maillard browning	Cannot list any factors	Lists some correct factors and some incorrect factors	Lists most correct factors	Lists all correct factors
Discuss the four levels of protein structure with specific reference to denaturation of proteins	Does not correctly list levels or characteristics	Gives correct and incorrect levels and/or characteristics	Gives a partial list of correct levels and characteristics	Is able to discuss all four levels as well characteristics of each level
Describe the influence of heat, pH and salt on the structure of proteins in foods	Cannot analyze or describe influences	Partially analyzes influences with some incorrect information	Describes correctly but incompletely the influence of factors	Describes thoroughly and correctly the influence of factors
Design a high protein food product to be thermally processed in a manner to minimize the Maillard reaction	Does not design a food product	Designs a product with a combination of correct and incorrect information	Designs a product but leaves out essential information on the Maillard reaction	Designs a high protein product with explanation of minimizing Maillard reaction negative effects on amino acid bioavailability

B. Acceptable and Ideal Targets

The acceptable target is to have less than 25% of students in the Novice or Intermediate categories, with more than 20% in the Expert category.

The ideal target is to have no student in the Novice or Intermediate categories, with more than 30% in the Expert category.

C. Key Personnel

Dr. Phil Crandall, Instructor of the class

D. Summary of Findings**Table 1.1: Summary of student performance on outcome 1.1**

	Novice	Intermediate	Advanced	Expert
Able to list and discuss factors influencing Maillard browning	0	1	6	23
Able to discuss denaturation of proteins related to protein structure	0	3	13	16
Able to describe influence of pH, heat, salt on protein structure	0	2	3	21

Able to design a product to minimize Maillard browning	0	3	5	24
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More than 90% of students met the criteria for Advanced or Expert knowledge in all levels of the rubric. On the most basic level of the rubric, listing and discussing factors involved in Maillard browning, only one student fell in the intermediate group. This particular student did not attend lectures or labs regularly which we feel is a large factor in the lackadaisical performance on this most basic knowledge. Five other students failed to attain Advanced or Expert on the other three levels of the rubric. One of these students is a non-native English speaker and may have simply not had the vocabulary to respond correctly to the questions (the two highest levels of the rubric). The other four students who fell in the intermediate area in one or two of the levels simply seemed to not be fully engaged in the learning process.

E. Recommendations

We plan to reassess our presentation methods for next year with the desire of fully engaging all students in the process.

Outcome 1.2: Explains the principles behind analytical techniques associated with food and selects appropriate techniques.

A. Assessment Measure 1.2

Student learning will be assessed using formal lab reports and selected test questions.

FDSC 4113 and 4111L: Food Analysis and Food Analysis laboratory

1. Lectures and laboratory exercises containing the necessary knowledge to fulfill the outcomes rubrics will be provided to students.
2. Students will complete formal lab reports and exam questions of knowledge and synthesis.

Direct Measures:

- A. Formal laboratory reports include a description of the activity, the results and an interpretation of the results, including speculation on causes of any possible unexpected results.
- B. Exams contain multiple choice, short answer as well as synthesis type questions where students are expected to demonstrate knowledge of analytical methods, and why and when to use them.

Rubric 1.2

Rubrics will be developed by the Instructor in charge of the class

B. Acceptable and Ideal Targets

The acceptable target is to have less than 25% of students in the Novice or Intermediate categories, with more than 20% in the Expert category.

The ideal target is to have no student in the Novice or Intermediate categories, with more than 30% in the Expert category.

C. Key Personnel

Dr. Ya-Jane Wang, Instructor of the class

D. Summary of Findings.

Not applicable

Outcome 1.3: Demonstrates knowledge in food chemistry and food analysis methods

A. Assessment Measure 1.3

Student performance on a problem solving laboratory exercise was used to measure achievement of this outcome.

FDSC 4113/4111L: Food Analysis and Laboratory:

1. A laboratory problem-solving exercise integrated all materials learned in the Food Analysis lectures and labs and in the Food Chemistry course, including quantitative and qualitative skills, in the form of a class project was provided to students to fulfill the knowledge areas assessed in the rubric.
2. Students (n = 14) conducted analyses in groups (2-3 students in a group). Each group was provided with a commercial food product and asked to analyze its nutrition information for food labelling purpose, including protein, fat, total carbohydrate, sugars, dietary fiber, sodium, calcium, sodium, and vitamin C, in a two-week period. After completing the analyses, students needed to analyze the data and to prepare a PowerPoint presentation and a written report including a concise report of the final results and the calculations showing what and how they obtained from the data.

Direct Measures (examples):

- A. Students were provided with a commercial food product, e.g. entrée or nutritional drinks, and needed to select the appropriate analytical methods to analyze its nutritional components. For example, for fat analysis, the Soxhlet method is appropriate for entrée, whereas the Mojonnier method is more appropriate for nutritional drinks. Sample pretreatment, such as drying, may be needed prior to fat analysis by using the Soxhlet method if the food product has a high moisture content.
- B. The nutrition information obtained were compared against the food label on the food product for accuracy. The standard deviation of each analysis was used to assess data reliability. The calculations of results were evaluated for the understanding of the principle of each analysis. For example, a significantly lower fat content may indicate inappropriate sample preparation and/or insufficient extraction. A high standard deviation of any analysis may indicate poor sample preparation and/or sloppy lab skills. A missing or an inaccurate dilution factor when calculating a nutritional component may indicate the lack of understanding of the principles of the analysis.

Rubric 1.3

	Novice	Intermediate	Advanced	Expert
Method selection and Laboratory skills	Some of the methods employed are appropriate but some mistakes are made either in the use of methodology or the implementation of	Some of the methods used are appropriate and are for the most part well executed. Some of the methods used may not be the best choice or some minor details of the methodology	Most of the methods used are appropriate and well executed.	The methods used are what would be recommended by a professional. The methods are correctly implemented and the student understands why experimental procedures are what they are.

	the testing methodology	incorrectly implemented		
Data Reliability	The data is unreliable and poorly represented orally and/or in writing	Some of the data is reliable and adequately presented orally and in writing	Most of the data is reliable and adequately presented orally and in writing	The data analysis is correct and appropriate methods are employed. The data is effectively presented orally and in writing
Clarity of Calculations	How the final data was calculated is not clearly shown	How the final data was calculated is clearly shown for some part	How the final data was calculated is clearly shown for most part	How the final data was calculated is very clearly shown
Overall analyses understanding	Understanding of the principles of each analysis is not shown	Some understanding of the principles of each analysis is shown	Understanding most of the principles of each analysis is shown	Excellent understanding of the principles of each analysis is clearly shown

B. Acceptable and Ideal Targets

The acceptable target is to have less than 25% of students in the Novice or Intermediate categories, with more than 20% in the Expert category.

The ideal target is to have no student in the Novice or Intermediate categories, with more than 30% in the Expert category.

C. Key Personnel

Dr. Ya-Jane Wang, Instructor for the course

D. Summary of Findings.

Table 1.3: Summary of the number of students achieving each knowledge level (N = 14)

	Novice	Intermediate	Advanced	Expert
Method selection and Laboratory skills	0	0	0	14
Data Reliability	0	0	9	5
Clarity of Calculations	0	0	11	3
Overall analyses understanding	0	0	3	11

E. Recommendations

Overall, all students achieved advanced knowledge in selecting the methods, conducting the analyses, and analyzing and reporting the results for nutrition label purpose. There is no major weakness tied to the outcome being assessed.

Outcome 2.1: Demonstrates ability to identify the causes of food spoilage and predict the specific microorganisms that can spoil a given food when prepared, processed, and stored under given conditions.

A. Assessment Measure 2.1

Student performance on the test covering lectures and on lab reports dedicated to microbial spoilage were used:

FDSC 4122 and 4121L: Food Microbiology and Food Microbiology Lab:

1. Lectures provided students with the necessary knowledge to fulfill the outcomes rubrics. Lectures were open to Biological Sciences major students whose results are not included in the report.
2. Students (n = 16) completed lab reports with special emphasis on the two last rubrics.

Direct Measures:

Tests included multiple choices questions and scenario based short answer questions on the rubrics asking for lists of parameters, microbes, factors or recommendations. Accuracy and completeness were used to determine students' scores and classification.

Example: You are given a piece of meat that tastes sour and acid. What was the likely packaging? And the spoilage microbes involved?

Students taking the lab were asked to discuss their results in light of the two last rubrics. Comprehension of the topics was assessed and used for scoring.

Example: Students were expected to describe the type of spoilage the microbes studied can cause.

Questions relevant to some of these rubrics were asked in the first test and final exam. Significant differences in outcome are indicated in the results with first test results in parentheses.

Rubric 2.1

	Novice	Intermediate	Advanced	Expert
Able to predict the parameters that led to specific spoilage	Does not correctly identify parameters	Predicts SOME parameters together with incorrect predictions	Predicts only correct parameters	Correctly predicts ALL parameters leading to spoilage
Able to predict the microbes involved in specific spoilage	Does not correctly predict potential spoilers	Predicts SOME potential spoilers together with incorrect predictions	Predicts only correct potential spoilers	Lists ALL correct potential spoilers

Understands how extrinsic and intrinsic factors lead to spoilage	Gives incorrect description of extrinsic/intrinsic factors	Describes SOME factors together with incorrect predictions	Predicts only correct potential factors	Describes thoroughly and correctly extrinsic/intrinsic factors
Able to recommend changes in the food processing to prevent spoilage	Provides inappropriate recommendations	Gives a list of appropriate and inappropriate recommendations	Gives a partial list of appropriate recommendations	Gives a complete and specific list of appropriate recommendations

B. Acceptable and Ideal Targets

The acceptable target is to have less than 25% of students in the Novice or Intermediate categories, with more than 20% in the Expert category.

The ideal target is to have no student in the Novice or Intermediate categories, with more than 30% in the Expert category.

C. Key Personnel

Franck Carbonero, Instructor of the class

D. Summary of Findings.

Table 2.1. Summary of student performances on the outcome 2.1. (N = 16)

	Novice	Intermediate	Advanced	Expert
Able to predict the parameters that led to specific spoilage			2	12
Able to predict the microbes involved in specific spoilage (number in parentheses are for the first test)		(2)1	(5)3	(9)12
Understands how extrinsic and intrinsic factors lead to spoilage			3	13
Able to recommend changes in the food processing to prevent spoilage			3	13

- Table 2.1. shows that all students (N = 16) demonstrated satisfactory achievement of outcome 2.1., based on the criteria.
- It appears that the students initially struggled with remembering spoilage organisms' names, probably because they are less "famous".

E. Recommendations

I will create one or two summary slides listing the important organisms to remember by food types and emphasize that knowing those organisms is crucial.

Outcome 2.2: Demonstrates ability to identify important pathogens, the conditions under which they grow, related detection techniques, and methods for inactivation and control.

A. Assessment Measure 2.2

Student performance on the test covering lectures and on lab reports dedicated to microbial spoilage were used:

FDSC 4122 and 4121L: Food Microbiology and Food Microbiology Lab:

1. Lectures provided students with the necessary knowledge to fulfill the outcomes rubrics. Lectures were open to Biological Sciences major students whose results are not included in the report.
2. Students (n = 16) completed lab reports with special emphasis on the two last rubrics.

Tests included multiple choices questions and scenario based short answer questions on the rubrics asking for lists of parameters, microbes, factors or recommendations. Accuracy and completeness were used to determine students' scores and classification.

Examples: Cite 3 methods used to IDENTIFY pathogenic microbes in food
Cite 3 methods used to QUANTIFY pathogenic microbes in foods

Students taking the lab were asked to discuss their results in light of the two last rubrics. Comprehension of the topics was assessed and used for scoring.

Example: Students were expected to describe the type of illnesses caused by the microbes studied and if the food tested was safe for consumption.

Questions relevant to some of these rubrics were asked in the first test and final exam. Significant differences in outcome are indicated in the results with first test results in parentheses.

Rubric 2.2

	Novice	Intermediate	Advanced	Expert
Able to predict pathogens potentially encountered in specific food	Does not correctly identify potential pathogens	Predicts SOME potential pathogens together with incorrect predictions	Predicts only correct potential pathogens	Correctly predicts ALL the potential pathogens for any given food
Able to list the mode of action and the symptoms incurred by different	Does not correctly list mode of action and/or symptoms	Gives a partial list of correct AND incorrect mode of action/symptoms	Gives a partial list of correct mode of action/symptoms	Lists ALL mode of action/symptoms

foodborne pathogens				
Understands the methodological approaches to detect and culture different foodborne pathogens	Misunderstands or misinterprets the methodology (Or misidentify the pathogen)	Describes correctly only parts of the approaches	Describes correctly but incompletely the approach for pathogen detection/cultivation	Describes thoroughly and correctly the rationale and approach used for pathogen detection/cultivation
List the conditions that favor pathogens development	Does not correctly list conditions	Gives a partial list of correct AND incorrect conditions	Gives a partial list of correct conditions	Gives a complete and specific list
List the conditions that limit/prevent pathogens development	Does not correctly list conditions	Gives a partial list of correct AND incorrect conditions	Gives a partial list of correct conditions	Gives a complete and specific list

B. Acceptable and Ideal Targets

The acceptable target is to have less than 25% of students in the Novice or Intermediate categories, with more than 20% in the Expert category.

The ideal target is to have no student in the Novice or Intermediate categories, with more than 30% in the Expert category.

C. Key Personnel

Franck Carbonero, Instructor of the course

D. Summary of Findings.

- Table 2 shows that all students ($N = 16$) demonstrated satisfactory achievement of outcome 2.2., based on the criteria.
- The addition of guest lectures from industrial (Tyson) food microbiology testing labs clearly improved the students' understanding of both traditional and modern methodologies. Therefore, I will aim at inviting another guest lecturer with expertise in pathogen control in the food industry in order to improve the slight deficiencies in this area.

E. Recommendations

A few students struggled with memorizing bacterial/fungal genera names and their modes of action/symptoms, which may be addressed by short pop quizzes during the lab sessions.

Outcome 2.3: Employs food preservation techniques to reduce and/or inhibit the growth of microorganisms.

A. Assessment Measure 2.3

Student learning will be assessed using selected test questions in the following classes:

FDSC 3103: Principles of Food Processing

FDSC 4122: Food Microbiology

1. Lectures and laboratory exercises containing the necessary knowledge to fulfill the outcomes rubrics will be provided to students.
2. Students will complete formal exam questions of knowledge and synthesis.

Direct Measures:

- A. Exams contain multiple choice, short answer as well as synthesis type questions where students are expected to demonstrate knowledge of sanitation strategies and their efficiency in limiting microbial contamination risk and/or inhibit their growth.

Rubric 2.3

Rubrics will be developed with the instructors in charge of the classes

B. Acceptable and Ideal Targets

The acceptable target is to have less than 25% of students in the Novice or Intermediate categories, with more than 20% in the Expert category.

The ideal target is to have no student in the Novice or Intermediate categories, with more than 30% in the Expert category.

C. Key Personnel

Dr. Ruben Morawicki and Dr. Franck Carbonero, Instructors of the classes

D. Summary of Findings.

Not applicable

Outcome 3.1: Understands the principles and current practices of processing techniques and the effects of processing parameters on product quality

A. Assessment Measure 3.1

Student performance on selected short problems covering lectures and lab reports dedicated to the effect of food processing on stability and safety of the final products

FDSC 3103: Principles of Food Processing

1. Lectures will provide students with the necessary knowledge to become proficient in the skills addressed in the rubric (below).

2. Laboratory exercises will provide applications of lecture concepts

Direct Measures

Four groups of questions relevant to each Outcome were selected from the three exams and used to establish the competency level for each of them. Questions are included in the Appendix. The rubric for this evaluation contains 4 outcomes and 4 levels of competency: Novice, Intermediate, Advanced, and Expert.

Rubric3.1

	Novice	Intermediate	Advanced	Expert
1. PREDICTS the potential preservation treatment based on the type of food (e.g. high acid or low acid), microorganisms, and pathogenic microorganisms	Does not correctly identify preservation treatments	Predicts SOME treatments together with incorrect ones	Predicts only correct treatments	Correctly predicts ALL potential preservation treatments
2. PREDICTS the type of packaging to protect the food from environmental factors (e.g. oxygen, light, moisture, microorganisms)	Does not correctly predict the type of packaging	Predicts SOME potential packaging as well as some incorrect packaging	Predicts the correct packaging	Suggests several alternatives
3. UNDERSTANDS the main steps in a processing plant (e.g. raw material preparation, slicing, treatment, packaging)	Gives incorrect description of the type of processing steps	Describes SOME correct steps and some incorrect ones	Predicts only correct steps	Describes more than one potential alternative
4. RECOMMENDS a gate-to-gate procedure to process a specific food product, selecting the type of processing and packaging	Provides unsuitable recommendations	Gives a list of appropriate and inappropriate recommendations	Gives a partial list of appropriate recommendations	Gives a complete and specific list of appropriate recommendations

B. Acceptable and Ideal Targets

The acceptable target is to have less than 25% of students in the Novice or Intermediate categories, with more than 20% in the Expert category.

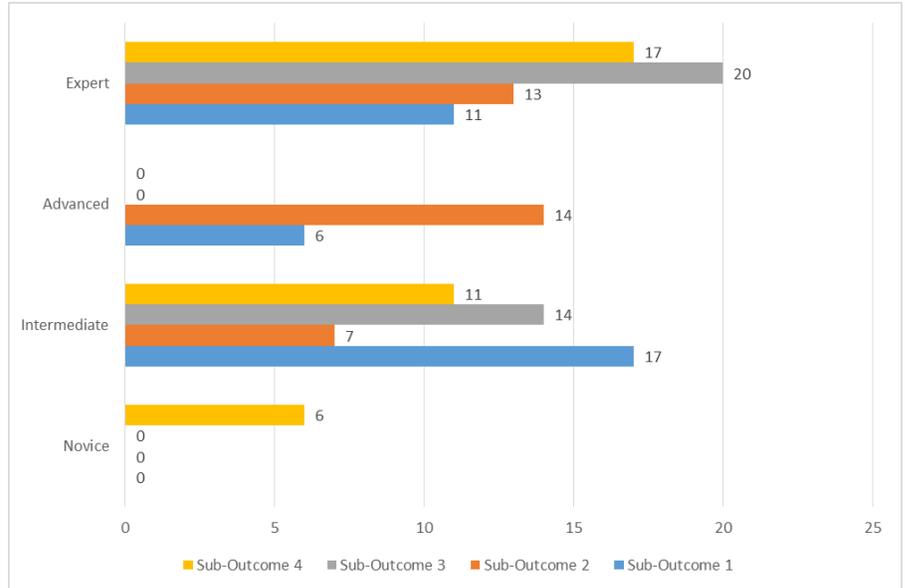
The ideal target is to have no student in the Novice or Intermediate categories, with more than 30% in the Expert category.

C. Key Personnel

Ruben Morawicki, Instructor for the course

D. Summary of Findings.

The Fall of 2015 class had initially 35 students enrolled. One student dropped the class by the end of the semester, therefore this evaluation was conducted on 34 students. The figure below shows the number of students in each of the four levels of competency for each sub-outcome. Only 6 students were in the Novice level for the whole Rubric and most students were in the Intermediate and Expert level. More than 80% of the students were at the



Intermediate or above level and more than 20% were in the expert level. Both of these parameters indicate satisfactory achievement for the class.

E. Recommendations

Based on the results, adjustments will be made to the class curriculum to improve student’s performance in Sub-Outcome 4. These adjustments will consist of incorporating case studies or mini-research projects to integrate the knowledge learned during the course in a more comprehensive way. These exercises will give students the opportunity to make recommendations of the type of processing technologies and packaging that needs to be applied to selected representative industries. In addition, students will be evaluated on these topics.

Outcome 3.2: Applies principles of food processing and engineering to various food industry operations.

A. Assessment Measure 3.2

Student learning will be assessed using selected test questions.

FDSC 4754: Engineering Principles of Food Processing

1. Lectures and laboratory exercises containing the necessary knowledge to fulfill the outcomes rubrics will be provided to students.

2. Students will complete formal exam questions of knowledge and synthesis.

Direct Measures:

Exams contain multiple choice, short answer as well as synthesis type questions where students are expected to demonstrate knowledge of sanitation strategies and their efficiency in limiting microbial contamination risk and/or inhibit their growth.

Rubric 2.3

Rubrics will be developed with the instructor in charge of the class

B. Acceptable and Ideal Targets

The acceptable target is to have less than 25% of students in the Novice or Intermediate categories, with more than 20% in the Expert category.

The ideal target is to have no student in the Novice or Intermediate categories, with more than 30% in the Expert category.

C. Key Personnel

Dr. Griffiths Atungulu, Instructor of the class

D. Summary of Findings.

Not applicable

Outcome 4.1: Applies and incorporates the principles of Food Science in practical, real-world situations and problems such as those encountered in Product Development.

A. Assessment Measures 4.1

Student performance on exam essay questions designed to apply food science principles to solve food industry related problems and issues was used to measure success in achieving this outcome. Questions were used that assessed application and synthesis of basic concepts to solve problems, data analysis and interpretation skills as well as creative thinking in the areas of Product Development, Food Analysis and Formulation, Food Engineering, Food Microbiology, and Food Processing.

FDSC 4114: Food Analysis:

1. A problem solving question integrating class and laboratory materials and concepts covered in other food science courses was included in the final exam.
2. Students (n = 22) answered the exam question.

FDSC 4713: Product Innovation for the Food Scientist:

1. Two problem solving questions integrating class and laboratory materials and concepts covered in other food science courses were included in the exams.
2. Students (n = 13) answered the exam question.

Example of problem solving question:

As you know obesity is a major concern in the US. Over 30% of school children are obese. There is a demand for low calorie, nutrient and fiber dense food products to target this market. You are challenged to prepare a tasty lunch meal that is aimed at reducing obesity in this school population. This should not be the same as your team project. A) Name the produce and justify the selection of the raw materials for your product. List each ingredient and write its functionality in your product; B) Write the process and product description in details, including packaging; C) Describe the strategies you will use for marketing and promoting the produce; and D) Discuss the impact and future potential of your product.

Thirty-five students total were evaluated for Outcome 4.1.

Rubric 4.1

The following rubric was applied for evaluation of the exam question in FDSC 4114:

	Novice	Intermediate	Expert
Understand the principles behind analytical techniques associated with food analysis (25-pt)	Does not identify key components to analyze the problem correctly	Identifies most of the key issues to be addressed	Accurately identifies all the key issues to be addressed
Identifies an appropriate method to analyze a specific food component with specific property (25-pt)	Does not identify a practical approach/strategy to solve the problem	Develops a less than ideal approach/strategy to solve the problem	Develops a viable approach/strategy to solve the problem
Effectively executes the problem strategy to analyze (25-pt)	Has significant problems in executing the problem solving strategy	Is effective to some degree in executing the problem solving strategy	Effectively executes the problem solving strategy
Ability to integrate food analysis principles to develop a nutrition label based on information provided (25-pt)	Has significant problems in integrating food science disciplines to solve problems	Is effective to some degree at integrating food science disciplines to solve the problem	Effectively integrates food science disciplines to solve the problem
Sum (100-pt)			

The following rubric was applied for evaluation of the exam question in FDSC 4703:

	Novice	Intermediate	Expert
Identifies and explains the interactions among the critical factors that impact the development of a new product (25 pts)	Does not identify key interactions that impact product development	Identifies most of the key issues to be addressed	Accurately identifies all the key issues to be addressed
Demonstrates the ability to integrate core knowledge to create new products based on sound science (25 pts)	Does not identify a practical approach/strategy to develop a new product	Develops a less than ideal approach/strategy to develop a new product	Develops a viable approach/strategy to develop a new product

Develops a multi-dimensional plan for solving problems with a practical approach that strengthen skills in both oral and written communication (25 pts)	Has significant problems in executing the development plan	Is effective to some degree in executing the development plan	Effectively executes the development plan
Utilize the problem solving skills to identify and propose test solutions to solve it (25 pts)	Has significant problems in integrating food science disciplines to solve problems	Is effective to some degree at integrating food science disciplines to solve the problem	Effectively integrates food science disciplines to solve the problem
Sum (100-pt)			

B. Acceptable and Ideal Targets

The acceptable target is to have less than 25% of students in the Novice or Intermediate categories, with more than 20% in the Expert category.

The ideal target is to have no student in the Novice or Intermediate categories, with more than 30% in the Expert category.

C. Key Personnel

Dr. Navam Hettiarachchy, Instructor of the class

D. Summary of Findings.

Not applicable

Outcome 4.2: Student applies the principles of food processing and engineering to various food industry operations.

A. Assessment Measure 4.2

Student learning will be assessed using selected test questions.

FDSC 4754: Engineering Principles of Food Processing

1. Homework sets (10) are provided to students throughout the semester to practice concepts discussed during lectures
2. Unit exams (3) are used to test students' comprehension and ability to apply concepts in each of the 4 technical areas (Mass and energy balances, drying; Heat transfer; Fluid flow; Refrigeration and cooling/freezing). The unit exams comprise both essay (approximately 20% of each exam) and mathematical problem-solving questions; the exams are given during lab sessions, allowing ample time to complete the exam.
3. All students complete a final exam covering the four units of the course. The final exam is constructed to test the ability of the students to solve food industry related problems.

Direct Measures:

Exams contain multiple choice, short answer as well as synthesis type questions.

Rubric 4.2

Rubrics will be developed with the instructor in charge of the class

B. Acceptable and Ideal Targets

The acceptable target is to have less than 25% of students in the Novice or Intermediate categories, with more than 20% in the Expert category.

The ideal target is to have no student in the Novice or Intermediate categories, with more than 30% in the Expert category.

C. Key Personnel

Dr. Griffiths Atungulu, Instructor of the class

D. Summary of Findings.

Not applicable

Outcome 4.3: Critically evaluate reports/information related to food quantitative analytical skills including the application of statistical principles.

A. Assessment Measure 4.3

Student learning will be assessed using selected test questions.

Sensory Evaluation of Food (FDSC 4413/4401L):

1. Laboratory exercise reports, a group project report, and a final exam were used to determine whether students could analyze and interpret the data obtained in the sensory evaluation of food.
2. Students (n = 30) completed laboratory exercises, a group project, and the final exam..

Direct Measures:

- A. Student performance on laboratory exercise reports and exams were used to evaluate the achievement of this outcome. Questions were designed to check student ability for analyzing the data on the basis of statistical principles in the laboratory exercise reports and exams.

Rubric 4.3

	Novice	Intermediate	Advanced	Expert
Experimental Design	<ul style="list-style-type: none"> • The series of methods proposed or employed do not fully and correctly answer the question. 	<ul style="list-style-type: none"> • The series of methods proposed or employed fully, but not correctly answer the question. 	<ul style="list-style-type: none"> • The series of methods proposed or employed fully and correctly answer the question, but may fall a little short. 	<ul style="list-style-type: none"> • The series of methods proposed or employed fully and correctly answer the question and minimize the amount of testing required.

Statistical Analysis and Interpretation	<ul style="list-style-type: none"> • Knowledge of statistical techniques is deficient. • Most interpretation of the data analysis is incorrect or omitted. 	<ul style="list-style-type: none"> • The data analysis is not always correct which might lead to erroneous conclusions. • Interpretation of the data analysis is sometimes correct, but not always. 	<ul style="list-style-type: none"> • The correct analysis is performed for a particular type of data. • The analysis employed may not be sophisticated or some mistakes in calculations are made. • The interpretation is somewhat superficial. 	<ul style="list-style-type: none"> • The analysis of the data is correct and some sophisticated methods are employed when appropriate. • Interpretation of the data is always correct and logical.
Report of Statistical Analysis)	<ul style="list-style-type: none"> • Most statistical results are described incorrectly and insufficiently. 	<ul style="list-style-type: none"> • Statistical results are sufficiently described, but some results are described incorrectly. 	<ul style="list-style-type: none"> • Statistical results are sufficiently described, but need additional clarification. 	<ul style="list-style-type: none"> • Statistical results are sufficiently and appropriately described.
Critical Thinking-Statistical Analysis	<ul style="list-style-type: none"> • Interpretation of statistical results obtained is mostly incorrect or omitted. 	<ul style="list-style-type: none"> • Interpretation of statistical results obtained is sometimes correct, but not always. 	<ul style="list-style-type: none"> • Interpretation of statistical results obtained is correct, but somewhat superficial. 	<ul style="list-style-type: none"> • Interpretation of statistical results obtained is always correct and appropriate.

B. Acceptable and Ideal Targets

The acceptable target is to have less than 25% of students in the Novice or Intermediate categories, with more than 20% in the Expert category.

The ideal target is to have no student in the Novice or Intermediate categories, with more than 30% in the Expert category.

C. Key Personnel

Dr. Han-Seok Seo, Instructor of the class

D. Summary of Findings.

Not applicable

Outcome 4.4: Understands the basic principles of sensory analysis.

A. Assessment Measure 4.4

Achievement of this program outcome was assessed through a group project assigned to groups of 3 students at the beginning of the senior Fall semester.

Sensory Evaluation of Food (FDSC 4413/4401L):

1. Group project reports were used to determine whether students could understand the basic principles of sensory analysis.
2. Students (n = 30) completed a group project report,

Example of Group Projects: A LED lamp company hires you to conduct a research project. The company wants to know whether the lighting source in a restaurant can influence consumers' food perception. Your group is charged with designing a study that would answer this question. As a group,

you may decide to conduct a single or a series of experiments. You will then conduct the experiment(s), analyze and interpret the data, and provide robust conclusions. You will be asked to provide an individual 12-15 page report and make a 20 min group presentation to the class. The report should be written according to the guideline of the “Journal of Sensory Studies” (http://www.blackwellpublishing.com/pdf/JSS_manuscript_style_guide.pdf)

Rubric 4.4

	Novice	Intermediate	Advanced	Expert
Statement of the Problem	<ul style="list-style-type: none"> Statement of the problem is omitted or inaccurate. 	<ul style="list-style-type: none"> Statement of the problem is described, but not clearly articulated. 	<ul style="list-style-type: none"> Statement of the problem is clearly described, but some key details are omitted. 	<ul style="list-style-type: none"> State of the problem is clearly and completely described.
Experimental Design	<ul style="list-style-type: none"> The series of methods proposed or employed do not fully and correctly answer the question. 	<ul style="list-style-type: none"> The series of methods proposed or employed fully, but not correctly answer the question. 	<ul style="list-style-type: none"> The series of methods proposed or employed fully and correctly answer the question, but may fall a little short. 	<ul style="list-style-type: none"> The series of methods proposed or employed fully and correctly answer the question and minimize the amount of testing required.
Use of Methodologies	<ul style="list-style-type: none"> Most of the methods used are inappropriate and many mistakes are made either in the use of methodology or the implementation of the testing methodology. 	<ul style="list-style-type: none"> Some of the methods employed are appropriate but some mistakes are made either in the use of methodology or the implementation of the testing methodology. 	<ul style="list-style-type: none"> Most of the methods used are appropriate and are for the most part well executed. Some of the methods used may not be the best choice or some minor details of the methodology are incorrectly implemented 	<ul style="list-style-type: none"> The methods used are what would be recommended by a sensory professional. The methods are correctly implemented and the students understand the reason why experimental procedures are used.
Data Analysis	<ul style="list-style-type: none"> Knowledge of statistical techniques is deficient. 	<ul style="list-style-type: none"> Some knowledge of statistical techniques is evident. Hypotheses are not necessarily stated or understood. The analysis of the data is not always correct which might lead to erroneous conclusions. 	<ul style="list-style-type: none"> The correct analysis is performed for a particular type of data. The analysis employed may not be sophisticated or some mistakes in calculations are made. 	<ul style="list-style-type: none"> The analysis of the data is correct and some sophisticated methods are employed when appropriate.

<p>Description of Results</p>	<ul style="list-style-type: none"> • Most results are described incorrectly and insufficiently with formats of text, Table, or Figure. 	<ul style="list-style-type: none"> • Results are sufficiently described with appropriate formats for text, Tables, or Figures. • Some results are described incorrectly. 	<ul style="list-style-type: none"> • Results are sufficiently described with appropriate formats for text, Tables, or Figures. • Most results are described in a correct manner, but need additional clarification. 	<ul style="list-style-type: none"> • Results are sufficiently described with appropriate formats for text, Tables, or Figures. • The data is presented in such a way that it can be effectively presented to non-sensory scientists.
<p>Interpretation of Results</p>	<ul style="list-style-type: none"> • Most interpretation of the data analysis is incorrect or omitted. 	<ul style="list-style-type: none"> • Interpretation of the data analysis is sometimes correct but not always. • In some cases, interpretation of the results is not statically based. 	<ul style="list-style-type: none"> • Interpretation is always statistically based and correct. • The interpretation is somewhat superficial and does not always take into account logical next steps or appropriate recommendations. 	<ul style="list-style-type: none"> • Interpretation of the data is always correct and the interpretation of the data considers limitations of the methods used, potential experimental problems and logical next steps or recommendations
<p>Discussion</p>	<ul style="list-style-type: none"> • Discussion on the project, in terms of (a) statement of the problem, (b) experimental design, (c) data analysis, (d) results, and (e) application, is very limited. • None to 2 out of five aspects are discussed. 	<ul style="list-style-type: none"> • Discussion on the project, in terms of (a) statement of the problem, (b) experimental design, (c) data analysis, (d) results, and (e) application, is tried, but needs in more details. • Three out of five aspects are discussed 	<ul style="list-style-type: none"> • Discussion on the project, in terms of (a) statement of the problem, (b) experimental design, (c) data analysis, (d) results, and (e) application, is mostly complete. • Four out of five aspects are discussed 	<ul style="list-style-type: none"> • Discussion on the project, in terms of (a) statement of the problem, (b) experimental design, (c) data analysis, (d) results, and (e) application, is efficiently done. • Five out of five aspects are discussed
<p>References</p>	<ul style="list-style-type: none"> • Few references related to the project are listed throughout the report. • Most references are not correctly listed according to the requirement. 	<ul style="list-style-type: none"> • Many references related to the project are listed throughout the report. • Many mistakes of format are observed throughout the report. 	<ul style="list-style-type: none"> • Most references related to the project are listed throughout the report. • Most references are correctly listed according to the requirement, but some mistakes are done. 	<ul style="list-style-type: none"> • References related to the project are completely listed throughout the report. • References are correctly listed according to the requirement.

B. Acceptable and Ideal Targets

The acceptable target is to have less than 25% of students in the Novice or Intermediate categories, with more than 20% in the Expert category.

The ideal target is to have no student in the Novice or Intermediate categories, with more than 30% in the Expert category.

C. Key Personnel

Dr. Han-Seok Seo, Instructor of the class

D. Summary of Findings.

Not applicable (assessed in Fall 2014)

Outcome 4.5: Understands government laws and regulations required for the manufacture and sale of food products.

A. Assessment Measure 4.5

Student performance on the tests covering lectures and homework assignment.

FDSC 3202: Introduction to Food Law

1. Lectures were provided to food science students with the necessary information to fulfill the knowledge areas assessed in the rubric. This is also an elective course in the legal studies minor, which is administered by the Political Science Department. In addition dietetics, health professional, engineering and social science students take this course as an elective. These non-Food Science students' results are not included in the report.

Direct Measures:

A. Recalls history, legal structures, government agencies, legal publications and processes

Example questions included in the test given to the students are provided below:

1. Distinguish between the following:
 - a) Role of FDA and USDA in food regulation
 - b) Role of FTC and FDA
 - c) US Code and USCA
 - d) An Injunction and an Emergency Permit Control
2. Match the following with the correct letter (w-z). You may use the same letter more than once, or not at all:

Federal Food Drug and Cosmetic Act	w) Administrative law
Standard of Identity of Tomato Soup	x) Case law
US v 7 Barrels of Dried Eggs	y) Statutory law
CFR	z) Development law
USCA	
S.Ct.	

B. Recalls of legal principles and makes distinctions between concepts and make judgements

1. Comment on the truth of the following statements with specific reference to the food adulteration law described in the FFD&CA.
 - a) 'A food may contain a poisonous or deleterious substance and still not be legally adulterated'.
 - b) 'A case of adulteration can be established even if the food itself is safe and nutritious'.
 - c) 'Economic adulteration and misbranding is basically the same thing'.
 - d) 'Misbranding relates only to information on the labeling'
 - e) 'You can make a zero cholesterol labeling claim for peanuts as it contains no cholesterol'

C. Applies knowledge and skill of food law and regulation literature to solve practical problems.

Students were also asked to complete a homework assignment involving solving problems using the code of federal regulations. This could be done using either online resources or hard copy information.

Examples of questions included in the assignment are:

1. You are running a bakery and wish to make milk bread rather than the regular bread.
 - a) You find a cheap source of buttermilk and consider using it in your product.
 - b) Is the use of buttermilk in milk bread acceptable?
 - c) Soy lecithin is being used as an emulsifier in the bread. Could you use egg lecithin as an alternative emulsifier?
 - d) You are producing half pound bread loaves. However, due to processing error the loaves weigh 6 ounces. Can the product legally be called bread? If not, what should it be called?
2. You are working in a Product Development Lab on baked products.
 - a) Your manager wants to add Coumarin to a new baked product because of its antioxidant activity. Is it legal to do so?
 - b) The new product contains 3mg of sodium chloride per serving. Can it be described as "salt free"?
 - c) You wish to add Aspartame to the new product. What are the limitations on the concentration in this food?

D. Analyzes legal problems in a professional situation and produce a solution.

Students are given a take-home final exam that consists of problem solving essay questions integrating main principles of the course. This exam will be used assess analysis and problem solving skills.

Example of questions included in the take home final exam are below:

1. 'Food law and regulations' are one of the Institute of Food Technology (IFT) Applied 'core competencies for an IFT approved Food Science BS degree. Students gaining competency in the Food law and regulations' are expected to: ***'Know government regulations required for the manufacture and sale of food products'***
 - a) Explain why, or why not, this is an adequate description of what student knowledge and skills should be on completing a Food Law course in order to be competent in the food industry?
 - b) Suggest alternative statement(s) if you feel this is appropriate and explain why they are an improvement
2. You have just been hired by a small new food company as 'regulatory affairs officer' in charge of all the food law issues and to keep your management informed of food legal developments.

Just after you are hired your company president is replaced by someone from the auto industry who is not convinced that your position is really necessary. He would rather use these funds to expand marketing department. You are asked to give a 30 min. formal presentation justifying your position to senior management to show the importance of your job and working knowledge of food law to the company. You must also include why it is vital retain a regulatory affairs officer, rather than expand the marketing department.

- a) Provide a transcript (copy) of the speech. This should show well organized structured arguments.
 - b) Assuming you are successful, provide a formal memo to provide your management with answers to the following questions:
 - i. What literature and facilities do you require in order to be informed and effective, in this position?
 - ii. What policies or emergency plans should be developed in order to deal with, avoid or reduce specific legal problems and crisis that may arise?
 - iii. What legal areas and issues should upper management be well informed about and why?
3. Larry Lawless is president of *Larry's Luscious Foods*, a manufacturer located in Houston, Texas. Larry is very active in the company's affairs and often makes decisions relating to product formulations, production and labeling. *Larry's Luscious Foods* produces lemon pies at Houston from ingredients that have been shipped from outside Texas. Due to brisk business Larry contracts with *Badactor Products*, also in Houston, to make cherry pies under Larry's brand. Larry visited *Badactor Products* and found them to have high sanitation standard and good manufacturing practices. Larry sends his own QA manager to the *Badactor* plant on a weekly basis to check production. No deficiencies are found.

Meanwhile, at his own plant Larry notices that the soaring costs of new materials to make lemon pies are significantly decreasing company profits. He tells his manufacturing and commercial employees, "I don't care how you do it, but you've got to bring down the cost of these raw materials".

Three incidents then arise:

A FDA inspector in Tennessee finds Larry's lemon pies adulterated with rodent excreta. There is substantial evidence of rodent activity in the Tennessee warehouse where the pies are stored.

Within one week of Larry's order to reduce the raw material costs, a FDA inspector appears at Larry's plant in Houston and takes samples of four lots of Larry's lemon pies being held in the warehouse awaiting distribution. Analysis of the pies shows that the pies contain citric acid in place of lemon juice, even though the label states "*made with real lemons*". Prior to the manufacture of these pies, Larry's Pies always contained lemon juice. Larry was unaware of the formulation change.

An outbreak of Salmonellosis in Oklahoma City is traced to Larry's cherry pies produced by *Badactor*. Subsequent investigation shows that one shipment of milk powder used by *Badactor* to produce the pies was positive for salmonella.

- a) What specific violations of the FFD&CA is Larry guilty of and why?
- b) If you were the defense lawyer how would you argue the case for Larry?

Could Larry be liable for criminal prosecution? Explain your answer.

Rubric 4.5

	Novice	Intermediate	Advanced	Expert
Recalls history, legal structures, government agencies, legal	Does not correctly recall principle information	Correctly recalls SOME principle information with a	Correctly recalls MANY principle information with a few errors	Correctly recalls almost ALL principle information with negligible errors

publications and processes		significant number of errors		
Recalls of legal principles and makes distinctions between concepts and make judgements	Does not correctly recall principle information	Correctly recalls SOME principle information with a significant number of errors	Correctly recalls MANY principle information with a few errors	Correctly recalls almost ALL principle information with negligible errors
Applies knowledge and skills of food law and regulation literature to solve practical problems	Does not correctly apply knowledge and skill of food law and regulation literature to solve practical problems	Correctly applies knowledge and skill of food law and regulation literature to solve SOME practical problems with a significant number of errors	Correctly applies knowledge and skill of food law and regulation literature to solve MANY practical problems with a few errors	Correctly applies knowledge and skill of food law and regulation literature to solve ALL practical problems with negligible errors
Analyzes legal problems in a professional situation and produces a solution	Does not correctly analyze problems or produce a solution	Correctly analyzes SOME problems and SOMETIMES produces a solution	Correctly analyzes MANY problems and OFTEN produces a solution	Correctly analyzes ALL problems and ALWAYS produces a solution

B. Acceptable and Ideal Targets

The acceptable target is to have less than 25% of students in the Novice or Intermediate categories, with more than 20% in the Expert category.

The ideal target is to have no student in the Novice or Intermediate categories, with more than 30% in the Expert category.

C. Key Personnel

Dr. Andy Proctor, Instructor of the class

D. Summary of Findings.

Not applicable (Assessment was performed in Spring 2015)

Outcome 5.1: Works effectively independently as well as in a team setting.

A. Assessment Measure 5.1

FDSC 4121L and 4304 Food Microbiology Lab and Food Chemistry Lab

FDSC 4713: Product Innovation for the Food Scientist

1. Students conduct experiments on their own or as a pair. Effectiveness is judged by the ability to obtain quality data in the expected range and/or providing logical explanation for unexpected results/failed experiments
2. Students are grouped in teams to apply and incorporate the principles of Food Science to develop a new product. Effectiveness is assessed by the judges committee based on the oral presentation

Direct Measures:

- A. Data obtained through lab experiments are compared to the expected results. If the data significantly deviate, students are asked if the data is logical and why.
- B. Oral presentation, Judging the products developed, an assessment by the committee were used to determine whether a student can apply, analyze, evaluate and be creative

Rubric 5.1

Rubrics will be developed with the Instructors in charge of the classes

B. Acceptable and Ideal Targets

The acceptable target is to have less than 25% of students in the Novice or Intermediate categories, with more than 20% in the Expert category.

The ideal target is to have no student in the Novice or Intermediate categories, with more than 30% in the Expert category.

C. Key Personnel

Dr. Navam Hettiarachchy, Philip Crandall and Franck Carbonero, Instructors of the classes

D. Summary of Findings.

Not applicable

Outcome 5.2: Appreciates the importance of and is committed to professional integrity and ethical values within the workplace.

A. Assessment Measure 5.2

FDSC 431V: Internship in Food Science

Direct Measures:

- A. Employer reports on attendance and punctuality,
- B. Employer reports on diligence and motivation
- C. Employer reports on professionalism and integrity
- D. Employer reports on planning and foresight
- E. Employer reports on problem solving skills
- F. Employer reports on communication skills
- G. Employer reports on knowledge and learning

Rubric 5.2

The following rubric will be applied for evaluation of Outcome 5.2 in FDSC 431V:

	Novice	Intermediate	Advanced	Expert
Attendance and punctuality (10-point)	<ul style="list-style-type: none"> • Often does not reports to work or arrive on time. 	<ul style="list-style-type: none"> • Most of time reports to work and arrives on time. 	<ul style="list-style-type: none"> • Almost always reports to work on time. 	<ul style="list-style-type: none"> • Always reports to work and arrives on time.

Diligence and motivation (15-point)	<ul style="list-style-type: none"> Little motivation doing minimal work, sometimes not completing projects on time 	<ul style="list-style-type: none"> Somewhat motivated and does acceptable work, often completing projects on time. 	<ul style="list-style-type: none"> Most of the time is well motivated and does good work, completing projects in the required on time. 	<ul style="list-style-type: none"> Always is highly motivated and does excellent work, completing projects on time.
Professionalism and integrity (15-point)	<ul style="list-style-type: none"> Professionalism and integrity are not evident. 	<ul style="list-style-type: none"> Professionalism and integrity are in early stages of development. 	<ul style="list-style-type: none"> Most of the time shows a high degree of professionalism and integrity. 	<ul style="list-style-type: none"> Always shows a high degree of professionalism and integrity.
Planning and foresight (15-point)	<ul style="list-style-type: none"> Poor planning skills and poor anticipation of potential problems that may arise. 	<ul style="list-style-type: none"> Sometimes plans work carefully and sometimes anticipates problems that may arise. 	<ul style="list-style-type: none"> Usually carefully plans work and often anticipates problems that may arise. 	<ul style="list-style-type: none"> Always carefully plans work and always anticipates problems that may arise.
Problem solving skills (15 points)	<ul style="list-style-type: none"> Poor independent problem solving skills. 	<ul style="list-style-type: none"> Has some independent problem solving skills, but often needs help 	<ul style="list-style-type: none"> Good independent problem solving skills, but occasionally may need help 	<ul style="list-style-type: none"> Excellent independent problem solving skills
Communication skills (15 points)	<ul style="list-style-type: none"> Poor excellent communication skills. 	<ul style="list-style-type: none"> Is developing communication skills with personnel at some levels of the organization. 	<ul style="list-style-type: none"> Good communication skills with personnel at most levels of the organization. 	<ul style="list-style-type: none"> Excellent communication skills with personnel at all levels of the organization
Knowledge and Learning (15 points)	<ul style="list-style-type: none"> Not prepared academically for the internship 	<ul style="list-style-type: none"> Minimally prepared academically for the internship 	<ul style="list-style-type: none"> Adequately prepared academically for the internship 	<ul style="list-style-type: none"> Very well prepared academically for the internship

B. Acceptable and Ideal Targets

The acceptable target is to have less than 25% of students in the Novice or Intermediate categories, with more than 20% in the Expert category.

The ideal target is to have no student in the Novice or Intermediate categories, with more than 30% in the Expert category.

C. Key Personnel

Andy Proctor is the instructor

D. Summary of Findings.

Not applicable

Outcome 6.1: Demonstrates ability to write clear and concise technical reports and research articles.

A. Assessment Measure 6.1

Student performance on technical papers and reports in class research activities were used to measure the achievement of this outcome. Three courses have been chosen for this evaluation.

FDSC 4114: Food Analysis:

1. Students conducted a nutritional analysis of a specific food and were required to submit a written technical summary that included a concise description of the problem, methods used for analysis, and the final results.
2. Students (n = 22) completed the written lab report.

FDSC 4413/4410L: Sensory Evaluation of Food:

1. Based on a group project, each student (n = 30) submitted a 10-12 page (double-spaced) research report that included an introduction, materials and methods, results, discussion, and references.

Rubric 6.1

	Novice	Intermediate	Expert
Identifies a specific topic	Difficult to identify or states the obvious but then provides unclear structure	Topic may be unclear or vague; provides little structure for the paper	Topic is clear, insightful and provides logical and sound structure for the paper
Support for specific topic	Difficult to identify or understand; conflicting ideas are identified but not seriously considered or integrated into the paper	Support for topic is generally clear and appropriate, but wanders occasionally; conflicting ideas are identified but not seriously considered or integrated into the paper	Support for topic is identifiable, reasonable and sounds; conflicting ideas are seriously considered
Thoroughness of research	Failure to support statements through evidence; evidence is poorly analyzed, poorly incorporated or incorrect	Evidence is given in support of most points, but some may be inappropriately placed and gaps in logic may exist	Every point is supported with a least one example from primary resources.
Organization of writing	Lacks effective organization of ideas with limited transitions or connections; conclusion is confusing, unrelated to the paper topic or nonexistent	Evident organizational pattern with some lapses; a few unclear transitions may exist between major divisions of the paper; conclusion summarizes points but does not provide closure	Logical organizational pattern; clearly organized ideas with appropriate transitions between major sections of the paper; conclusions briefly summarize results and provides closure
Writing: mechanics and style	Many errors in spelling, grammar, paragraph and sentence structure; unclear and confusing	Intermittent errors; clear but not interesting; wordy and redundant	Spelling, grammar, paragraph, and sentence structure are correct; clear, active, interesting

B. Acceptable and Ideal Targets

The acceptable target is to have less than 25% of students in the Novice or Intermediate categories, with more than 20% in the Expert category.

The ideal target is to have no student in the Novice or Intermediate categories, with more than 30% in the Expert category.

C. Key Personnel

Dr. Ya-Jane Wang and Dr. Han-Seok Seo, Instructors of the classes

D. Summary of Findings.

Not applicable

Outcome 6.2: Clearly communicates scientific principles and data to lay audiences.

A. Assessment Measure 6.2

FDSC 4713 Product innovation for Food Scientist

Direct Measures:

- A. Evaluation form provided to the assessment committee containing rubrics reflecting the entire Food Science curriculum knowledge

Rubric 6.2

Rubric will be developed with the Instructor in charge of the class

B. Acceptable and Ideal Targets

The acceptable target is to have less than 25% of students in the Novice or Intermediate categories, with more than 20% in the Expert category.

The ideal target is to have no student in the Novice or Intermediate categories, with more than 30% in the Expert category.

C. Key Personnel

Dr. Navam Hettiarachchy, Instructor of the class; and the assessment committee

D. Summary of Findings.

Not applicable

5. Overall Recommendations

Instructors will be encouraged to fully integrate assessment into their grading strategy (even when they don't have to provide a report). The assessment committee will aim at showing that, when well integrated, clear outcomes from an assessment plan can be used to improve grading schemes and provide students with clear and specific expectations for tests, assignments and reports.

Persistent weaknesses will be addressed by slight or significant changes in lectures content, assignment strategies, and increased use of pop-quizzes among many other potential options. Instructors will be requested to provide their assessment data so that students' deficiencies and expected curricular improvements can be tracked.

6. Action Plan

To be determined during the faculty's teaching retreat later this summer.

7. Supporting Attachments

Rubrics are embedded in the document.