Program Assessment Plan/Report
Undergraduate Program in Food Science
University of Arkansas
2017-2018

1. Department Name & Contact Information
Department of Food Science
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FDSC Assessment Committee: Franck Carbonero, Kristen Gibson, Andy Proctor

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 is assessed using pre-lab questions, formal lab reports and selected test questions at three levels of assessment including synthesis:
FDSC 4304 and 4304L: Food Chemistry and Food Chemistry laboratory
1. Lectures and laboratory exercises containing the necessary knowledge to fulfill the outcomes rubrics are provided to students.
2. Students complete 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

Outcomes are assessed on a rotation. Outcome previously assessed in 2015-2016. Not applicable.

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. This outcome is currently integrated in **Outcomes 1.3 and 4.1**:

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: Rubric is integrated in **Outcomes 1.3 and 4.1**.

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.
Outcomes are assessed on a rotation. Outcome previously assessed in 2015-2016. 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 is 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 conduct analyses in groups (2-3 students in a group). Each group is 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 need 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 data and how the data are used to obtain them.

Direct Measures (examples):

A. Students are 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 are compared against the food label on the food product for accuracy. The standard deviation of each analysis is used to assess data reliability. The calculations of results are 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 the testing methodology	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 incorrectly implemented	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.
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.
Outcomes are assessed on a rotation. Outcome previously assessed in 2015-2016. Not applicable.

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 are used:

FDSC 4122 and 4121L: Food Microbiology and Food Microbiology Lab
1. Lectures provide students with the necessary knowledge to fulfill the outcomes rubrics. Lectures are open to Biological Sciences major students whose results will not be included in the report.
2. Students complete 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 are asked to discuss their results in light of the two last rubrics. Comprehension of the topics is 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 are asked in the first test and final exam. Significant differences in outcome will be 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.**

Outcomes are assessed on a rotation. Outcome previously assessed in 2015-2016. Not applicable.

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 are used:

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

1. Lectures provide students with the necessary knowledge to fulfill the outcomes rubrics. Lectures are open to Biological Sciences major students whose results will not be included in the report.
2. Students will complete lab reports with special emphasis on the two last rubrics.

Tests include multiple choices questions and scenario based short answer questions on the rubrics asking for lists of parameters, microbes, factors or recommendations. Accuracy and completeness are 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 will be asked to discuss their results in light of the two last rubrics. Comprehension of the topics will be 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 will be asked in the first test and final exam. Significant differences in outcome will be 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 foodborne pathogens	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
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.
Outcomes are assessed on a rotation. Outcome previously assessed in 2015-2016. Not applicable.

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

A. Assessment Measure 2.3
Student learning was assessed using selected test questions in the following classes:
FDSC 3103: Principles of Food Processing
1. Lectures and laboratory exercises containing the necessary knowledge to fulfill the outcomes rubrics were provided to students.
2. Students (n = 21) completed 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:

	Novice	Intermediate	Advanced	Expert
2.3.1 PREDICTS the potential growth of microorganisms based on the type of foods (e.g. high vs. low water activity)	Does not correctly predict the type of microorganisms	Predicts SOME together with incorrect ones	Predicts groups of microorganisms	Correctly predicts specific microorganisms
2.3.2 UNDERSTANDS the effects on microorganisms of different processing techniques (e.g.	Gives incorrect answers about the effect of processing techniques on microorganisms	Describes SOME correct steps and some incorrect ones	Include in answers only correct techniques	Describes more than one potential alternative

blanching, cooking, pasteurization, sterilization)				
2.3.3 RECOMMENDS potential preservation treatment based on the type of food (e.g. high acid or low acid)	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
Dr. Ruben Morawicki, Instructor of the course

D. Summary of Findings
Outcomes are assessed on a rotation. Outcome previously assessed in 2015-2016. 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 learning was assessed using selected test questions in the following classes:
FDSC 3103: Principles of Food Processing
1. Lectures were provided to students with the necessary knowledge to become proficient in the skills addressed in the rubric (below).
2. Laboratory exercises were provided to give applications of lecture concepts

Direct Measures

Four groups of questions relevant to each sub-outcome were included in the final exam and used to establish the competency level for each sub-outcome.

Rubric 3.1:

	Novice	**Intermediate**	**Advanced**	**Expert**

3.1.1 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
3.1.2 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
3.1.3 RECOMMENDS procedures 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
Outcomes are assessed on a rotation. Outcome previously assessed in 2015-2016. Not applicable.

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 in the following course:

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:
A. The comprehensive final is designed to quantitatively indicate the learning outcome of students for each part of the rubric
B. Homework sets related to each part of the rubric are also considered.

Rubric 3.2:

	Novice	Intermediate	Advanced	Expert
Understand mass and energy balance principles used to analyze food process engineering problems in various food industry operations	Cannot (1) represent a mass and energy balance process diagrammatically, (2) define boundaries, (3) determine streams entering and leaving a process, and (4) select appropriate basis of calculation; therefore fails to solve problems relevant to food process operations	Can represent a mass and energy balance process for single-stage processes diagrammatically, but with difficulty in multistage processes and may make mistakes in one or more of the subsequent steps: defining boundaries, determining streams entering and leaving or selecting appropriate basis of calculation; therefore fails to arrive at the correct solution.	Correctly represents a mass and energy balance process for single- and multi-stage processes diagrammatically, but may make mistakes in one or more of the subsequent steps: defining boundaries, determining streams entering and leaving or selecting appropriate basis of calculation; therefore fails to arrive at the correct solution.	Correctly represent a mass and energy balance process for single- and multi-stage unit operations diagrammatically, defines boundaries, determine streams entering and leaving, and select appropriate basis of calculation to successfully solve problems relevant to food process operations
Apply the knowledge of psychrometric processes to solve food process engineering problems in various food industry operations	Not able to (1) determine state points on psychrometric chart or steam tables, and (2) apply knowledge of psychrometric parameters, psychrometric processes, and steam tables (or temperature-enthalpy diagram of water) to perform food process engineering calculation involving drying and dehydration processes	Able to (1) determine state points on psychrometric chart and (2) apply knowledge of psychrometric parameters, psychrometric processes, but, has problems with steam tables (or temperature-enthalpy diagram of water) to perform food process engineering calculation involving drying	Can determine state points of given process on steam tables and psychrometric charts but may misinterpret a process such as adiabatic, simple heating or cooling processes, humidification, dehumidification, etc., leading to not successfully arriving at the correct solution.	Correctly interprets state points and psychrometric processes on psychrometric charts and steam tables, and correctly uses the charts and tables to perform food process engineering calculations involving drying and dehydration processes encountered in food industry operation.
Apply heat transfer principles to analyze steady- and unsteady-	Fails to apply the (1) concepts of resistance for calculating heat transfer, (2) use of	Understands the (1) concepts of resistance for calculating heat transfer, and (2) use of	Understands the concepts but makes mistakes in some steps during the application	Accurately apply (1) concepts of resistance for calculating heat transfer, (2) correct

state heat transfer processes typically encountered in food industry operations	dimensionless numbers to estimate convective heat transfer coefficients for single and multilayered systems, and (3) superimposition principles for finite dimensional objects to solve food process and engineering problems applicable to food industry operations; also cannot explain thermal properties of foods, such as specific heat capacity, conductivity, thermal diffusivity and impacts of food constituents on these properties	dimensionless numbers to estimate convective heat transfer coefficients for single and multilayered systems, but has problems dealing with unsteady-state heat transfer related problems including superimposition principles for finite dimensional objects to solve food process and engineering problems applicable to food industry operations; also struggles to explain thermal properties of foods, such as specific heat capacity, conductivity, thermal diffusivity and impacts of food constituents on these properties	of (1) concepts of resistance to calculate heat transfer for plane wall or radial configurations or single and multilayered systems, (2) dimensionless numbers to estimate convective heat transfer coefficients, and (3) superimposition principle to solve transient heat transfer problems; Also able to explain thermal properties of food, but not proficient in computing the value of these properties by taking into account moisture content and other food constituents.	dimensionless numbers to estimate convective heat transfer coefficients for single and multilayered systems, (3) superimposition principle to solve transient heat transfer problems applicable to food industry operations; Also able to explain thermal properties of food and proficient in computing the value of these properties by taking into account moisture content and other food constituents.
Understand principles of vapor compression and cooling systems and able to solve problems relevant to cooling- and freezing-load calculations in food industry operations	Not able to apply knowledge of vapor compression systems and use the Mollier diagram to calculate refrigeration and freezing load problems.	Knowledgeable about vapor compression and cooling systems but struggles in interpretation and use of the Mollier diagram to calculate refrigeration and freezing load problems.	Knowledgeable about vapor compression and cooling systems but may make simple mistakes when the stated problem requires in-depth analysis prior to direct use of the Mollier diagram to calculate refrigeration and freezing load problems.	Accurately applies principles of vapor compression and cooling systems including use of the Mollier diagram to calculate refrigeration and freezing load problems.
Employ principles of fluid flow to analyze fluid pumping systems	Misunderstands the energy components and mechanical energy balance of fluid flow, and therefore, fails to correctly analyze pumping systems and solve pump sizing problems for Newtonian and non-Newtonian fluids.	Able to understand the energy components and mechanical energy balance of fluid flow, but struggles to correctly analyze pumping systems and solve pump sizing problems for Newtonian and non-Newtonian fluids.	Describes energy components and mechanical energy balance of fluid flow, but may fail to interpret correctly the effect of adding some fittings that result in friction losses in the system; therefore correctly analyzes pumping systems but fails to arrive at correct solution for pump sizing problems for Newtonian and non-Newtonian fluids.	Describes accurately the energy components and mechanical energy balance of fluid flow and correctly analyzes pumping systems and solves correctly pump sizing problems for Newtonian and non-Newtonian fluids.

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
Outcomes are assessed on a rotation. Outcome previously assessed in 2014-2015, and then course was not taught during 2016-2017 academic year. 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 will be used to measure success in achieving this outcome. Questions will be used that assess 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. The following course is used for assessing this outcome:
FDSC 4113/4111L: Food Analysis and Laboratory
1. A problem solving question integrating class and laboratory materials and concepts covered in other food science courses will be included in the final exam.

Rubric 4.1
The following rubric is applied for evaluation of the exam question in FDSC 4113/4111L:

	Novice	Intermediate	Advanced	Expert
Understand the principles behind analytical techniques associated with food analysis	Does not identify key components to analyze the problem correctly	Identifies some of the key issues to be addressed	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	Does not identify a practical approach/strategy to solve the problem	Develops a less than ideal approach/strategy to solve the problem	Develops a close to ideal approach/strategy to solve the problem	Develops a viable approach/strategy to solve the problem
Effectively executes the problem strategy to analyze	Has significant problems in executing the problem solving strategy	Is effective to some degree in executing the problem solving strategy	Is effective to most 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	Has significant problems in integrating food science disciplines to solve problems	Is effective to some degree integrate food science disciplines to solve the problem	Is effective to most degree integrate food science disciplines to solve the problem	Effectively integrates food science disciplines to solve the problem

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

Outcomes are assessed on a rotation. Outcome previously assessed in 2015-2016. Not applicable.

E. Recommendations

FDSC 4713: Product Innovation for the Food Scientist will be included in the next assessment for this outcome.

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.
FDSC 4413/4401L: Sensory Evaluation of Food
1. Laboratory exercise reports, a group project report, and a final exam are used to determine whether students can analyze and interpret the data obtained in the sensory evaluation of food.
2. Students will complete laboratory exercises, a group project, and the final exam.

*Example: A coffee company ("ARKO") developed three blends (Blends A, B, and C) of roasted coffee beans. Sensory analyst of the company wanted to determine whether there is a significant difference in bitterness among the three blends. The sensory analyst conducted the ranking test (i.e., simple ranking test) with **a panel of 20 students.** Each panelist ranked the three samples according to the bitterness intensity: 3 (highest intensity) to 1 (lowest intensity).*

The data obtained from this testing are as follow:

Panelist No.	Blend A	Blend B	Blend C
1	3	1	2
2	3	3	2
-	-	-	-
-	-	-	-
19	2	1	3
20	1	2	3
Rank Sum	50	25	45

A) Using the below equation, please <u>calculate the statistic T-value with procedure description</u> (8-point; correct procedure with incorrect T-value = 5-point; Incorrect procedure with correct T- value = 2-point**).**

$$T = \frac{12}{bt(t+1)} \sum_{j=1}^{t} x_{\cdot j}^2 - 3b(t+1)$$

b = the number of panelists
t = the number of samples
$x_{\cdot j}$ = the rank sum of sample j

Answer:
B) Referring to **Table 19.5**, please <u>determine whether there is a significant difference</u> in bitterness among the three blends at the 1% level (i.e., $\alpha = 0.010$), based on your T-value **(c.f., H_0 = there is no significant difference in bitterness among the three blends at the 1% level).** <u>Please explain how to make your decision</u> **(7-point).**
Answer:

Direct Measures:

    A. Student performance on laboratory exercise reports and exams will be used to evaluate the achievement of this outcome. Questions are 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	• The series of methods proposed or employed do not fully and correctly answer the question.	• The series of methods proposed or employed fully, but not correctly answer the question.	• The series of methods proposed or employed fully and correctly answer the question, but may fall a little short.	• The series of methods proposed or employed fully and correctly answer the question and minimize the amount of testing required.
Statistical Analysis and Interpretation	• Knowledge of statistical techniques is deficient. • Most interpretation of the data analysis is incorrect or omitted.	• The data analysis is not always correct which might lead to erroneous conclusions. • Interpretation of the data analysis is sometimes correct, but not always.	• 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.	• 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	• Most statistical results are described incorrectly and insufficiently.	• Statistical results are sufficiently described, but some results are described incorrectly.	• Statistical results are sufficiently described, but need additional clarification.	• Statistical results are sufficiently and appropriately described.
Critical Thinking-Statistical Analysis	• Interpretation of statistical results obtained is mostly incorrect or omitted.	• Interpretation of statistical results obtained is sometimes correct, but not always.	• Interpretation of statistical results obtained is correct, but somewhat superficial.	• 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 (n = 16)

	Novice	Intermediate	Advanced	Expert
Experimental Design	0	0	6	10
Statistical Analysis and Interpretation	0	0	4	12
Report of Statistical Analysis	0	0	6	10
Critical Thinking on Statistical Analysis	0	1	7	8

E. Recommendations
Acceptable targets were met in all subcategories and ideal targets were met in all but 1 subcategory. None at this time.

Outcome 4.4: Understands the basic principles of sensory analysis.
A. Assessment Measure 4.4
Achievement of this program outcome will be assessed through a group project assigned to groups of 3 students at the beginning of the course.

FDSC 4413/4401L: Sensory Evaluation of Food
1. Group project reports were used to determine whether students could understand the basic principles of sensory analysis Students will complete a group project report.
2. Students will complete 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	• Statement of the problem is omitted or inaccurate.	• Statement of the problem is described, but not clearly articulated.	• Statement of the problem is clearly described, but some key details are omitted.	• State of the problem is clearly and completely described.

Experimental Design	• The series of methods proposed or employed do not fully and correctly answer the question.	• The series of methods proposed or employed fully, but not correctly answer the question.	• The series of methods proposed or employed fully and correctly answer the question, but may fall a little short.	• The series of methods proposed or employed fully and correctly answer the question and minimize the amount of testing required.
Use of Methodologies	• 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.	• 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.	• 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	• 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	• Knowledge of statistical techniques is deficient.	• 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.	• 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 analysis of the data is correct and some sophisticated methods are employed when appropriate.
Description of Results	• Most results are described incorrectly and insufficiently with formats of text, Table, or Figure.	• Results are sufficiently described with appropriate formats for text, Tables, or Figures. • Some results are described incorrectly.	• Results are sufficiently described with appropriate formats for text, Tables, or Figures. • Most results are described in a correct manner, but need additional clarification.	• 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.

Interpretation of Results	• Most interpretation of the data analysis is incorrect or omitted.	• Interpretation of the data analysis is sometimes correct but not always. • In some cases, interpretation of the results is not statically based.	• 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.	• 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
Discussion	• 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.	• 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	• 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	• 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
References	• Few references related to the project are listed throughout the report. • Most references are not correctly listed according to the requirement.	• Many references related to the project are listed throughout the report. • Many mistakes of format are observed throughout the report.	• 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.	• 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 (n = 16)

	Novice	Intermediate	Advanced	Expert
Statement of the Problem	0	1	5	10

Experimental Design	0	1	5	10
Use of Methodologies	0	1	7	8
Data Analysis	0	1	7	8
Description of Results	0	1	5	6
Interpretation of Results	0	1	5	6
Discussion	0	3	9	4
References	0	0	6	10

E. Recommendations

Acceptable targets were met in all subcategories and ideal targets were met in all but 1 subcategory.

- Students showed a relative weakness in discussing the results obtained from their group projects. In particular, they had difficulty integrating their results with the findings shown in earlier research. Therefore, the instructor put more time and effort into training students with respect to discussing results obtained from laboratory exercises for their laboratory reports, thereby resulting in most students being comfortable in searching for peer-reviewed articles as well as interpreting the findings.
- Students provided positive feedback on learning experiences obtained from the group projects of sensory science. In particular, many students commented that they felt more comfortable and confident in designing and conducting independent projects related to sensory analysis because they could experience all steps from brain storming to making a report. Furthermore, some students commented that they could better understand principles of sensory analysis throughout the group projects than through reading textbooks and lecture materials.

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 <u>are not included</u> 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	
SCt.	

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

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

1. Comment on the truth of the following statements with <u>specific reference to the food adulteration law described in the FFD&CA.</u>
    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. Applied knowledge and skill of food law and regulation to solve practical problems.

Students are 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 publications and processes	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
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	Does not correctly apply knowledge and skill of food	Correctly applies knowledge and skill of food law and	Correctly applies knowledge and skill of food law and	Correctly applies knowledge and skill of food law and

literal to solve practical problems	law and regulation literature to solve practical problems	regulation literature to solve SOME practical problems with a significant number of errors	regulation literature to solve MANY practical problems with a few errors	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

Outcomes are assessed on a rotation. Outcome previously assessed in Spring 2016. Not applicable.

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

FDSC 4713: Product Innovation for the Food Scientist
1. 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.

FDSC 431V Internship in Food Science
1. Observation of student performance by the supervisor of an industrial internship. The supervisor reports their observation by means of a questionnaire which is completed at the end of the internship.

Direct Measures:
A. 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.
B. The student's supervisor evaluate performance for the direct measures by a questionnaire that reflected rubric below. Additional written comments are also requested.

Rubric 5.1

FDSC 4713 used the following rubric: The rubric used for this outcome in FDSC 4713 is the Teamwork VALUE Rubric designed by the Association of American Colleges and Universities (https://www.aacu.org/value/rubrics/teamwork)

FDSC 431V used the following rubric:

	Novice	Intermediate	Advanced	Expert
Strongly motivated and takes initiative	Is NEVER strongly motivated and takes initiative	Is SOMETIMES strongly motivated and takes initiative	Is OFTEN strongly motivated and takes initiative	Is ALWAYS strongly motivated and takes initiative
Reliably and efficiently completes independent projects in a timely manner	NEVER reliably and efficiently completes independent projects in a timely manner	SOMETIMES reliably and efficiently completes independent projects in a timely manner	OFTEN reliably and efficiently completes independent projects in a timely manner	ALWAYS reliably and efficiently completes independent projects in a timely manner
Exhibits effective problem solving skills	NEVER exhibits effective problem solving skills	SOMETIMES exhibits effective problem solving skills	OFTEN exhibits effective problem solving skills	ALWAYS exhibits effective problem solving skills
Performs duties and interacts well with others in a professional manner	NEVER performs duties and interacts well with others in a professional manner	SOMETIMES performs duties and interacts well with others in a professional manner	OFTEN performs duties and interacts well with others in a professional manner	ALWAYS performs duties and interacts well with others in a professional manner
Works effectively in a team	NEVER works effectively in a team	SOMETIMES works effectively in a team	OFTEN works effectively in a team	ALWAYS works effectively in a team

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 and Dr. Andy Proctor, Instructors of the courses

D. Summary of Findings: Note, FDSC 4713 was not assessed during this rotation.

FDSC 431V: (n = 11)

	Novice	Intermediate	Advanced	Expert
Strongly motivated and takes initiative	0	1	1	9
Reliably and efficiently completes independent projects in a timely manner	0	0	3	8
Exhibits effective problem solving skills	1	0	5	5

	Novice	Intermediate	Advanced	Expert
Performs duties and interacts well with others in a professional manner	0	0	1	10
Works effectively in a team	0	2	2	7

E. Recommendations

Although the criteria set forth by the department was achieved in FDSC 431V, a couple of students were rated at the novice and intermediate levels. This means that these students exhibited strong motivation, completed independent projects and exhibited strong problem-solving skills only sometimes. This is probably not an acceptable outcome. In reviewing the rubric provided to the supervisor, the assessment committee is fine tuning the data collection instrument to better assess proficiencies. Supervisor assessment of student competencies have remained confidential. When unsatisfactory ratings are given by the supervisor in the future, the department will request that the supervisor meet with the intern to discuss the shortcomings of the evaluation.

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
1. Observation of student performance by the supervisor of an industrial internship. The supervisor reports their observation by means of a questionnaire which is completed at the end of the internship.

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:

	Novice	Intermediate	Advanced	Expert
Punctual in reporting to work, attending meetings and observing deadlines	Is NEVER punctual in reporting to work, attending meetings and observing deadlines	Is SOMETIMES punctual in reporting to work, attending meetings and observing deadlines	Is OFTEN punctual in reporting to work, attending meetings and observing deadlines	Is ALWAYS punctual in reporting to work, attending meetings and observing deadlines

Practices company ethics and values	NEVER practices company ethics and values	SOMETIMES practices company ethics and values	OFTEN practices company ethics and values	ALWAYS practices company ethics and values
Courteous and respectful to colleagues	Is NEVER courteous and respectful to colleagues	Is SOMETIMES courteous and respectful to colleagues	Is OFTEN courteous and respectful to colleagues	Is ALWAYS courteous and respectful to colleagues
Performs duties and interacts well with others in a professional manner	NEVER performs duties and interacts well with others in a professional manner	SOMETIMES performs duties and interacts well with others in a professional manner	OFTEN performs duties and interacts well with others in a professional manner	ALWAYS performs duties and interacts well with others in a professional manner

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 (n = 11)

	Novice	Intermediate	Advanced	Expert
Punctual in reporting to work, attending meetings and observing deadlines	0	0	2	9
Practices company ethics and values	0	1	3	7
Courteous and respectful to colleagues	0	0	0	11
Performs duties and interacts well with others in a professional manner	0	0	1	10

E. Recommendations

None. Overall student performance greatly exceeded the prescribed criteria with the exception of one student in the intermediate category of one sub-category.

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 are used to measure the achievement of this outcome. Three courses have been chosen for this evaluation.

FDSC 4114: Food Analysis:
1. Students conduct a nutritional analysis of a specific food and are required to submit a written technical summary that includes a concise description of the problem, methods used for analysis, and the final results.

FDSC 4413/4410L: Sensory Evaluation of Food:
1. Based on a group project, each student submits a 10-12 page (double-spaced) research report that includes 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.
Outcomes are assessed on a rotation. Outcome previously assessed in 2014-2015. Not applicable.

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

FDSC 431V: Internship in Food Science
1. At the completion of the internship each student will give an oral presentation to the Internships Committee which comprises of four faculty members, the academic advisor and the department head. The presentation should contain a brief background of the company; what was done during the internship; and how what was learned in the classroom was useful during the internship. The presentation will be evaluated by each Committee member according to the direct measures in the rubric below. The final score for each direct measure is the average of Committee members' scores.

Direct Measures:
A. Maintains good eye contact and rapport with audience without excessive use of notes.
B. Exhibits good body language that enhances the presentation.
C. Controls anxiety to present a relaxed presentation without verbal errors.
D. Speaks clearly with confidence, enthusiasm and authority.
E. The presentation is concise, clear, logical, and includes all the requested elements.
F. Slides are clear, well organized with appropriate use of color and effects.
G. Effectively answers related questions.

Rubric 6.2:

	Novice	**Intermediate**	**Advanced**	**Expert**
Maintains good eye contact and rapport without excessive notes	No eye contact with audience, because the report is read.	Minimal eye contact with audience, while the report is read.	Consistent use of direct eye contact with audience, but still returns to notes.	Holds attention of entire audience with the use of direct eye contact, seldom looking at notes.
Exhibits good body language that enhances the presentation	No movement or descriptive gestures.	Very little movement or descriptive gestures.	Made movements or gestures that enhances articulation.	Movements seem fluid and help the audience visualize.
Controls anxiety to present a relaxed presentation without verbal errors	Tension and nervousness is obvious; has trouble recovering from mistakes.	Displays mild tension; has trouble recovering from mistakes.	Makes minor mistakes, but quickly recovers from them; displays little or no tension.	Student displays relaxed, self-confident nature about self, with no mistakes.

Speaks clearly with confidence, enthusiasm and authority	Does NOT speak clearly with confidence, enthusiasm and authority.	SOMETIMES speaks clearly with confidence, enthusiasm and authority.	OFTEN speaks clearly with confidence, enthusiasm and authority.	ALWAYS speaks clearly with confidence, enthusiasm and authority.
The presentation is concise, clear, logical and includes all the requested elements	The presentation is NOT concise, clear, logical and does not include all the requested elements.	SOME of the presentation is concise, clear, logical and includes some of the requested elements.	MOST of the presentation is concise, clear, logical and includes most of the requested elements.	The presentation is CONSISTENTLY concise, clear, logical and includes all the requested elements.
Slides are clear, well organized with appropriate use of color and effects	Slides are NOT clear or well organized and lack appropriate use of color and effects.	SOME of the slides are clear and well organized and there is some appropriate use of color and effects.	Slides are MOSTLY clear and well organized and most contain appropriate use of color and effects.	Slides are CONSISTENTLY clear, well organized with appropriate use of color and effects.
Effectively answers related questions	Slides are NOT clear or well organized and lack appropriate use of color and effects.	SOME of the slides are clear and well organized and there is some appropriate use of color and effects.	Slides are MOSTLY clear and well organized and most contain appropriate use of color and effects.	Slides are CONSISTENTLY clear, well organized with appropriate use of color and effects.

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 course; internship committee members

D. **Summary of Findings (n = 11)**

	Novice	Intermediate	Advanced	Expert
Maintains good eye contact and rapport without excessive notes	0	0	4	7
Exhibits good body language that enhances the presentation	0	0	3	8
Controls anxiety to present a relaxed presentation without verbal errors	0	0	2	9
Speaks clearly with confidence, enthusiasm and authority	0	0	1	10
The presentation is concise, clear, logical and includes all the requested elements	0	0	4	7
Slides are clear, well organized with appropriate use of color and effect	0	0	4	7

Effectively answers related questions	0	0	3	8

E. Recommendations
None. Overall student performance greatly exceeded the prescribed criteria.

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 when the Assessment Committee convenes over the Summer.

7. Supporting Attachments
Rubrics are embedded in the document.