Food Science 2015-2016 Assessment

As part of our accreditation from the Institute of Food Technologists (IFT), the food science program develops a five year plan for assessment. Each year the program picks up to three courses or program objectives to evaluate. In the 2016-2016 academic year we two courses (NDFS 4400; Food Engineering, and NDFS 5110; Food Microbiology). In addition, we evaluated a program-level outcome of Information Acquisition. For each item evaluated the following is provided: Outcome measured, method of assessment and data analysis, summary of key findings and actions being taken based on the findings.

Outcome measured	In the NDFS program the following competencies were addressed in Food Engineering NDFS 4400, Fundamentals of Food Engineering: -Unit operations in food processing as demonstrated both conceptually and in practical laboratory settings. -Understanding thermal and mechanical principals that make a food product safe for consumption. -Understand the requirements for water utilization and waste management in food and food processing. -Creative thinking -Understand basic principles of renewable energy and its application to food processing
Method(s) of Assessment and data analysis	These learning objectives were measured by evaluating the performance on homework, four exams, 13 laboratories, four of which required lab report, and an oral presentation in class. They were also measured formatively using discussion sessions. An oral presentation was one method of assessment. This oral assignment required the student to apply the competencies; creative thinking and understand basic principles of renewable energy and its application to food processing. They were required to develop a presentation including some type of visual aid and deliver it in front of the class as one of the last assignments of the semester. Laboratories reports and questions asked on plant tours was a method of assessment.
Summary of Key Findings	All students scored greater than 75% on examinations. **Observations:** The final exam is not handed back to the students and is made as close as possible to be the same from year to year. This gives some indication of how students are

	improving or not from one class to another. Recently, scores on the final have risen slightly compared to past years. All students scored greater than 80% on homework assignments. **Observations:** All homework had to be handed in. Students were encouraged to work in groups on their homework. One way this was encouraged was to have the first examination be a 'cooperative exam'. The scores on the cooperative exam over several years of taking data was about 25 (out of 100) points above the average score on the remaining exams. All scored greater than 90% on the oral presentation. **Observations:** All students were adept at oral presenting (suggests preparation and previous experience). All students were competent in creating MS PowerPoint style presentations (organizing, graphics, etc) All students were successful in assembling presentations that included the competencies required. All students improved their lab report scores until all scored greater than 90% by the end of the term. **Observations:** Students were generally lacking in writing skills. One problem was a lack of skill in being succinct and yet complete in reporting observations. This was improved by teaching the students to use more charts and pictures to get their message across. Critical thinking: Some of my labs are 'open ended'. By that I mean, the students have to have a hypothesis or take the hypothesis that I give them and devise experiments to prove or disprove the hypothesis. For example, in one lab we make caramels. The hypothesis is that temperature is directly related to solids content in the caramel mixture because of colligative properties of the solid water mixture. With some help, the students come to understand that they need to monitor temperature of the boiling mixture and take samples for later analysis of solids content. Generally, they come to understand that they must make a graph of temperature vs solids content to show that there is a relationship and it can be predicted. In one of the first labs of the semester, the students are given a problem to solve that is most likely completely outside their comfort zone. They must solve the problem without help from the instructor. For example this past year, the problem was to 'pump' water from a lower elevation to a higher one without using a commercial pump or hands on devices such as a pitcher, ladle or anything of the kind. I had one student that used an old Erector set and devised buckets that lifted the water like a grain elevator. Another student used a heated vessel with a cooled plate above it which condensed the water vapor from the heated vessel. Another

	student put a lower vessel under pressure with a hand pump to force water to a higher elevation. There is no wrong solution if the device works. In general this lab is challenging for the students. **Professionalism:** I have a policy that students are encouraged help one another on assignments and labs, but cannot cheat on tests. **Interaction skills:** I have so much emphasis on this particular skill that I actually have the first exam as a cooperative exam. The students work the exam together. It is fun to sit in the corner and hear the conversation as one student tries to convince the other members of the class that s/he is right on a particular problem. Sometimes, the most eloquent student convinces the others to accept a wrong answer. What I am trying to teach is that the students should learn to work together and interact when they can such as on homework and labs and the first exam. I have kept track of the scores over a number of years and the score on the cooperative exam is significantly higher than the average when students take the exam individually. **Organizational skills:** This skill is further developed by forcing the students to do some of the labs together. The instructor simply hands out a sheet on what the students must prove or disprove. There is lab equipment and supplies provided and the students themselves are encouraged to 'get organized' in order to get the experiment done as quickly as possible.
Actions Being Taken Based on these Findings	Core competencies of knowing spoilage and deterioration mechanisms in foods and methods to control deterioration and spoilage and understand basic principles and practices of cleaning and sanitation in food processing operations are not being taught in the Fundamentals of Food Engineering course. These topics are important and either need to be covered in another course or a course likely entitled "Food Processing" needs to be added. The core competency of understanding the requirements for water utilization and waste management in food and food processing is covered and must be included because of the way the industry is moving. Also the competency to understand environmental concerns related to energy utilization such as contribution to greenhouse gases and global warming should be included. Student comments were that these topics are important to them.

Outcome measured	The IFT Core competency in Food Microbiology and Safety lists four main learning objectives: Pathogenic and spoilage microorganisms in foods Beneficial Microorganisms in food systems

	Influence of the food system on the growth and survival of microorganisms Control of microorganisms In the NDFS program these competencies are all addressed in Food Microbiology NDFS 5110/6110.
Method(s) of Assessment and data analysis	These learning objectives were measured summatively by evaluating the performance on three exams, writing assignments, and an oral presentation in the class. They were also measured formatively using discussion sessions. Specifically, the oral presentation was chosen as one method of assessment. This oral assignment requires the student apply three of the four competencies related to a single pathogen that causes foodborne illness. They are required to create a PowerPoint style presentation and deliver it in front of the class as one of the last assignments of the semester. Briefly discuss a current outbreak (Emphasize human importance of this illness) Basic biology of the microorganism (Information for better understanding) U.S. (and Utah if possible) foodborne incidence of the disease Most common foodborne sources (Information for better understanding) Control measures (How can the listener help prevent illnesses?) Conclusions (Reinforce major points)
Summary of Key Findings	For 2016 there were ten students enrolled in NDFS 5110. All scored greater than 90% on the oral presentation rubric. **Observations:** All students were adept at oral presenting (suggests preparation and previous experience). All students were competent in creating MS PowerPoint style presentations (organizing, graphics, etc) All students were successful in assembling presentations that included the food safety and microbiology facts regarding the competencies and rubric. There was a definite distinction in some students regarding upper level Blooms cognition regarding analysis and evaluation. Some students merely made citations and others noticeably made personal judgements based on citations. Timing (20-40 minutes) of presentations is one of the most difficult factors students face. Without much practice, they are unfamiliar with speaking tools to pace their presentations. This is more of a presenter's skill than a food safety/microbiology skill. The second method of assessment was formative based on student participation in Friday (once per week) topic discussions. Students are expected to work through online materials (reading, viewing online presentations, assignments, case studies, etc). This is followed with a discussion hour where the professor prompts students with important learning objective type questions regarding that week's topic. **Observations:**

	Students are adept at knowledge and understanding in the Blooms scale. Students are much less functional at the upper levels of Blooms (analysis and evaluation). The course (and topic) is just one semester limiting its ability to foray into upper level Blooms cognition.
Actions Being Taken Based on these Findings	The value of food microbiology as a course topic cannot be overemphasized. The safety of foods against microbiological hazards is paramount to the fundamental understanding of this topic. The prerequisite for the food microbiology course is a general microbiology course taken in another department. Students in USU Food Science are only required to then take Food Microbiology 5110 with the lab 5111 for a total of 4 credits. Students are proficient in the fundamental of food microbiology as demonstrated by the assessments. However, as noted the proficiency is in the bottom two levels of Blooms cognition. Naturally the lab provides some hands-on (application). In approximately 2011, the Food Microbiology course was transitioned into a blended learning course to help increase learning in the upper domains. All traditional lectures 150 minutes per week were recorded and placed online for 24/7 access. Students are required to view the materials and provide a written summary prior to class time. Class time is then used for discussions and case studies. In this manner the instructor can help connect learning objectives to the "bigger picture" of food science and food safety. One illustrative example is two hurdles can make a barrier. This concept is never discussed in any textbooks but is a valuable tool in making foods safe. At the present time the actual items learned in discussions are not measured. What is needed is a more formal way of assessing learning from these discussions. In 2016 discussions with Dr. Walsh, the instructor of Food Product Development, revolved around how her course could function as a capstone course. Students must tie together all of their knowledge and understanding (including food microbiology and safety as well as food chemistry) to create a viable food product. The principles of food microbiology and safety must be used and justified (validated). What is needed is a direct connection (obvious to students) of the value of items learned in food microbiology in the Food Product Development course. There is likely the same value for referencing other food science course material. In this way students are provided subject matter relevancy

Outcome measured	**Program outcome:** Information acquisition: competently using library resources and independently researching scientific and nonscientific information
Method(s) of Assessment and data analysis	Students in NDFS 5560 (Food Chemistry) were given an assignment to write a research paper on a relevant food chemistry topic. The students were given flexibility on the topic, but had to have it approved by the instructor. The students were given a list of items to address in the paper and examples of high quality papers from past years. The papers were graded by the course instructor and given

	a number grade out of 100. In addition, the papers were submitted to Turnitin, an online plagiarism software that compares submitted text to over 12 billion pages in the database. Lastly, the papers were evaluated using a rubric on information literacy obtained from HERB website by a second faculty member (Marie Walsh) who was not involved with the class. According to the header of the rubric (see appendix), the definition of information literacy is: The ability to know when there is a need for information, to be able to identify, locate and effectively and responsibly use and share that information for the problem at hand.
Summary of Key Findings	The originality scores for the papers ranged from 4%-22%. In addition to an originality score, Turnitin identifies the sources of the text that matches sections from the student papers. In one case, a low originality score (22%) was given to a paper because large sections had been copied directly from an FDA document. However, since this excerpt was indented, and properly identified as having been pulled from another source, it was not considered plagiarism. On the other hand, at least two papers had a number of sentences that were copied verbatim from the sources which were also cited. This is not considered acceptable as the text was not in quotations. Lastly, in some cases, there was sections of text (~2 sentences) That were apparently copied from web sources and were not given attribution. The scores given to the papers in the course ranged from 85%-95% indicating all students achieved at least a B in the assignment. The Information Literacy rubric has five sections. 1. Determine the extent of information needed 2. Access the needed information 3. Evaluate the information and its sources critically 4. Use information effectively to accomplish a specific purpose and 5. Access and use information ethically and legally. Each section of the rubric has 4 levels; 4-Capstone, 3,2-Milestones, and 1-Benchmark. Although we did not set an expectation a priori, we would like our students to achieve 3s and 4s in each section. The papers met the expectation for #1, #3, and #4, as the mean score was 3. The mean score for #2 and #5 were 2, which is lower than we would like. For #2 (Access the needed information) and #5 (Access and use information ethically and legally) the average rubric score was a 2. This is lower than we would like.
Actions Being Taken Based on these Findings	As a faculty, we take away from this evaluation that we need to use this assignment to reinforce information acquisition skills. Students were effective at determining what information needed to be accessed, and displayed sound evaluation skills. In addition, they were effective at organizing the information. The average score for #2 was a 2 because several students used unreliable sources of information. The average score for #5 was 2 because some students copied directs sections in their papers from references a) with proper and b) without properly citing them. To address this concern, the expectations regarding use of proper sources and originality will be introduced with the assignment. Students will be given a demonstration of literature searching using library resources such as Web of Science and online sources such as Google Scholar. This assignment will build on

	information acquisition skills our students are introduced to in English 2010, a research-based writing class required for all USU students.