Perceptions of Food Safety and Curricular Offerings[1]

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Abstract

Students in an introductory microeconomics course were surveyed to determine their level of awareness of what comprises the field of food safety, a university's food safety program and the demand for food safety graduates and their level of interest in learning more about a degree in food safety. There was considerable ignorance among student respondents about the availability of a food safety degree and diversity of thought regarding potential courses required for the degree. The students were surprisingly accurate in their top-of-mind definitions of food safety. Just under one-third of respondents mentioned each of the key areas of procedures/processes to ensure safety of food, food properly prepared and processed and food free of disease/contamination. Respondents in general were not interested in learning more about a degree in food safety. Nor were they particularly well versed in potential careers, with many respondents mentioning jobs that in general do not require post-secondary education and would generally include firm-sponsored on-the-job training.

Key Words: Food safety, curriculum, recruitment

Introduction

Growing concern for the safety of our food supply led to the development of a national food safety initiative which affects every aspect of the food chain, from farm to fork (North Dakota State University, 2010). In response to the resultant growing demand for food safety expertise, increasing the number of graduates with food safety education has become a priority for institutions in the Upper Great Plains. Currently, North Dakota State University (NDSU) offers BS, MS and PhD. degrees in food safety, as well as an undergraduate food safety minor. NDSU appears to be the only university offering an undergraduate major in food safety although other institutions offer certificates and graduate degrees in food safety. Michigan State University offers a food safety specialization for MS students in a variety of departments, as well as an MS in food safety offered through the College of Veterinary Medicine. The latter is primarily offered through on-line courses. Kansas State University offers an MS degree in Food Safety. An inter-institutional certificate in food safety is offered through Great Plains Interactive Distance Education Alliance (GPIDEA) via cooperation between Iowa State University, Kansas State University, the University of Missouri and the University of Nebraska. South Dakota State University (SDSU) offers an undergraduate minor in food safety.

Few degree programs in food safety combined with low student numbers in existing programs is of concern. Thus, collaborators at NDSU, SDSU and the University of New Mexico applied for and received a USDA Challenge Grant award with the overall goal being to expand student numbers and involvement in food safety academic programs, with a particular focus on under-represented groups including Native American and Latino populations. The focus for NDSU is on recruitment and retention.

Increasing the number of students graduating with training and experience in food safety calls for a planned process for recruitment, retention and graduation (Huddleston, 2000). One component of this process is to research enrollment and retention trends. Another component is the development and implementation of a marketing plan to inform students about academic programs in food safety and provide to them a value proposition to participate in these programs. Baseline data is necessary and will serve as a springboard for the development and implementation of marketing plans designed to increase enrollment in academic programs.

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Enrollment has remained relatively low in both the undergraduate and graduate programs in food safety at NDSU. Contributing factors may be lack of student interest in, or awareness or understanding of, the programs and related career opportunities. To provide a baseline from which to judge effectiveness of recruitment strategies, data was collected on students' current knowledge of food safety, composition of a food safety degree and careers in food safety, interest in a food safety degree and intent regarding an academic program in food safety.

Materials and Methods

A survey was conducted to gather the aforementioned baseline data. The survey was administered online via the Blackboard survey tool to students completing an online course entitled Introductory Microeconomics. It was available for students to complete during the last two weeks of fall semester 2007. Students were offered 10 points of extra credit for completing the survey, which could raise their grade by approximately one-half of one percent.

Knowledge, Education and Careers. Most research efforts to assess knowledge about food safety use measures such as performance on an assessment instrument that asks factual questions about food safety processes (e.g., proper refrigeration storage temperature). In this exploratory research we rather elicited top-of-mind definitional responses to gain an understanding of student perceptions of the field of food safety. Understanding of food safety was measured by participant responses to two questions: "What do you think of when you hear the term food safety?" and "At what point(s) in the food marketing channel do you think most food safety concerns arise?" For the latter question, students were first provided with the following information: *"The food marketing channel runs from the farmer producing a commodity (e.g., cattle, lettuce) to the end consumer eating a meal. In between are firms that process, transport and sell commodities and food."*

Awareness of food safety education was measured in two ways. First, participants were asked to *"try to imagine courses, other than those in general education, a student would take to get a degree in food safety."* They were asked to list at least four courses that might be required. Next, students were asked to respond to the question "Does NDSU offer an undergraduate degree in food safety?" Perception of food safety careers was also measured. Participants were asked to indicate their outlook on employment opportunities for food safety graduates. They were also asked to list at least four specific jobs that would require some coursework or experience in food safety.

Interest. Student interest was measured by responses to the question "What is your level of interest in learning more about a degree in food safety?" Students were asked to indicate interest on a scale of 1 (not interested at all) to 8 (very interested). Responses were collapsed into three categories of: not interested (based on a response of 1, 2 or 3), neutral (based on a response of 4 or 5), or interested (based on a response of 6, 7 or 8).

Demographic questions included major, gender, class and population of the town nearest to which they grew up. Students were also asked to identify the two most important factors that influenced their choice of major. Before data collection, permission to conduct research with human subjects was granted by the Institutional Review Board (IRB) at NDSU. Of the 43 students enrolled and actively engaged in the Introductory Microeconomics course, 38 completed the survey for a response rate of 88%. Twenty-one students were male. Five students were freshmen (13%), four (11%) were sophomores, eighteen (47%) were juniors and eleven (29%) were seniors. A diverse set of majors was included among participating students. Fourteen students were in majors within the College of Business. Only three students held majors within the College of Agriculture, Food Science and Natural Resources, within which the food safety degrees are housed. An interest in the field was mentioned by nearly two-thirds of students (63%) when asked to indicate two factors that most influenced their personal choice of major. Thirty-two percent mentioned job availability and 18% indicated personal skill in their chosen field.

Results and Discussion

Participants were asked what they think of when they hear the term "food safety." Responses were categorized. There were 41 valid responses from 36 students (five students offered two responses). Thirteen students thought of the existence of procedures to ensure the safety of food. Twelve specifically mentioned the concept that food has been properly prepared or processed. Eleven thought of food that is free from disease or contamination, with two of those students more generally indicating food that does not make us ill. Five students specifically mentioned that food safety brought to mind government oversight. These responses by students in general concurred with definitions of food safety from the literature and other sources (e.g., government or organization publications to include the United States Department of Agriculture and the Food and Drug Administration). Representative of definitions is that from the Food and Agriculture Organization / World Health Organization, offered in Unusan (2007, p. 45), *"the degree of confidence that food will not cause*

sickness or harm to the consumer when it is prepared, served and eaten according to its intended use."

Students were asked at what point in the food marketing channel they thought most food safety concerns arise. A majority of respondents perceived the point of origin of food safety concerns to be processing and transportation. There were forty-three responses from the thirty-eight respondents (five students offered two responses). Processing as the point of the greatest number of food safety concerns was mentioned by seventeen students, and transport was identified by eight. Only four identified the farm and only three the consumer (e.g., home preparation). Eight students indicated food safety concerns arise throughout the marketing channel and two mentioned the general idea of handling.

In the literature and popular press, it is in general reported that the origin of food borne disease outbreaks in developed countries is at the point of preparation. Points of preparation include at home and in commercial or institutional eating establishments. Haapala and Probart (2004) report that, in the majority of cases (79%), commercial or institutional eating establishments are implicated as the cause of food safety problems. Homes may comprise a larger percentage than is reported because food safety problems at home often go unreported or unidentified (Redmond and Griffith, 2003). The final point of preparation is key because it is almost impossible to guarantee pathogen-free food throughout the food marketing channel (Unusan, 2007).

Education and Career

Students were in general unaware that NDSU offered an undergraduate degree in food safety. When asked if NDSU offered such a degree, seven (18%) correctly indicated "yes", three (8%) indicated "no" and 28 (74%) indicated they did not know. Students did, however, recognize that the demand for graduates with a food safety degree exceeds supply. Thirty-one students (82%) indicated there was a shortage of food safety graduates, five (13%) indicated supply matched demand and only two thought there was a surplus of graduates. The reason behind the surprising result that students were aware of the existing shortage cannot be ascertained from the results.

Students were asked to name four jobs they thought required an employee to have some coursework or experience in food safety. Most commonly mentioned were those who work directly with food or food products, or their direct managers and food inspectors. Over half (20 students) specifically mentioned a chef, cook, or other food handler. Eighteen mentioned food inspectors or more generally a Food and Drug Administration or United States Department of Agriculture employee. Seventeen mentioned a restaurant or food retail store owner or manager. Fifteen mentioned line-type employees in a food processing facility. Nine mentioned agricultural producers. Other mentions included a dietician/nutritionist (seven students), grocery store employee (six), butcher (six), transportation/truck driver (six), health/fitness professional (three), laboratory worker (two) and childcare worker (two). The number of students mentioning a quality control person was the same number mentioning a mom, surprisingly only one. The NDSU Food Safety Website very broadly lists as typical employers of graduates the food industry (including agriculture production through food service and retail), government agencies, academia and research institutions.

Interest

Interest in learning about a degree in food safety was mixed. When asked to indicate interest on a scale of 1 (not interested at all) to 8 (very interested), approximately half were not interested (those responding with a one, two, or three). Nine were neutral (response of four or five) and the remaining nine expressed interest. A similar percentage of students among those perceiving there to be a shortage of food safety graduates (26%) expressed an interest in learning about the degree as among those perceiving supply to match demand (20).

Comparatively, the literature reports relatively high levels of interest in food safety among middle school children (Abbot and Byrd-Bredbenner, 2008; Abbot et al., 2010; Haapala and Probart, 2004) and hospital food service workers (Ramsay and Messersmith, 2001). Haapala and Probart (2004) also reported that females were more interested in food safety than males. In the current study, level of interest among female students (4.71, 1 = not interested at all to 8 = very interested) was also higher than that of male students (2.81) ($p = 0.01$).

Curriculum

Students were asked to name four classes other than general education classes that would be included in a food safety curriculum. Thirty-five responded, all but one student mentioning at least four classes. The remaining three students indicated they had no idea. Approximately half (19 students) mentioned a "hard science" class such as chemistry or biology. Interestingly, students with a major in the "hard sciences" were no more likely to name "hard science" classes than other students and in fact only 37% of those with majors in the hard sciences did so. Fourteen students mentioned a class in food processing and/or packaging, with four of these students also mentioning a class in food transportation or distribution. Twelve students mentioned a nutrition class, while

eleven mentioned a class in health or wellness. Eleven mentioned a class in cooking or food preparation. Eleven students mentioned a class in agriculture (generally) or a specific agricultural field (e.g., animal science). Other mentions were food regulation/inspection (six students); law (four students); and food borne illnesses (four students).

At NDSU, the Food Safety curriculum is selected by the student and his or her advisor. Students must complete University general education requirements and nine one-credit modules covering a wide scope of food safety topics (Figure 1). Students then select their remaining classes, specializing in one of five areas. Three specializations (production, processing and science) are comprised of classes falling under the STEM (Science, Technology, Engineering and Mathematics) disciplines and another (retail/consumer) is comprised largely of food handling courses (Table 1). Alternatively, the economics specialization suggests only non-STEM courses (e.g., Agricultural Economics, Communication). Flexibility in the curriculum accommodates one or more minors or a dual major.

Figure 1. Core Food Safety Courses at North Dakota State University (each one credit and offered on-line only)

SAFE 401 - Food Safety Information & Flow of Food - An orientation to food safety. How to find, evaluate and report credible food safety information and comprehension of food systems.

SAFE 402 - Foodborne Hazards - This course will lead students into the comprehension of the vast variety of chemical, physical and biological foodborne hazards.

SAFE 403 - Food Safety Risk Assessment - This course will enforce the concept that no food is 100% safe and will lead students to understand how to assess the likelihood of foodborne illness events.

SAFE 404 - Epidemiology of Foodborne Illness - This course will lead students to understand foodborne disease outbreaks, comprehend and apply epidemiologic models of disease causation and causal inference and apply disease outbreak investigation steps.

SAFE 405 - Costs of Food Safety - This course will lead students to comprehend and analyze the economic and societal costs of foodborne illness outbreaks.

SAFE 406 - Food Safety Crisis Communication - This course will lead students to understand the best ways to disseminate food safety information during or following a foodborne illness outbreak.

SAFE 407 - Food Safety Risk Management - This course will lead students to understand strategies and costs of reducing risk of foodborne illness.

SAFE 408 - Food Safety Regulatory Issues - This course will lead students to understand the food safety regulatory structure.

SAFE 409 - Food Safety Risk Communication & Education - This course will lead students to understand the importance of worker training and consumer education in food safety.

Conclusion

There is considerable room for educating students about a degree in food safety and the careers available to food safety graduates. Student respondents were not very well educated on where food safety concerns most often arise in the food marketing channel, were relatively ignorant about the availability of a food safety degree and in general had an erroneous perception of what students graduating with a degree in food safety would target as career options. Their perceptions of required courses that would be included in a food safety degree were wide in scope and they were in general not interested in the degree. It is not clear if interest can be improved with information and education about the degree and its associated careers, but testing this is a natural next step. There are clearly market segments of students defined by their interests and their perceptions of what comprises a curriculum in food safety and available career options. Recruitment efforts aimed at increasing student numbers in the program need to take the current level of ignorance about the program and its inherent flexibility into account.

This initial work is based on a limited sample size and will be expanded by conducting the survey in a wider variety of classes at NDSU, and to potential students at North Dakota high-schools and tribal colleges, the latter potential transfer students. Subsequent research will consider the value of intervention strategies aimed at increasing knowledge of and interest in a food safety degree and career.

Table 1. NDSU B.S. Degree in Food Safety: Courses recommended for students with potential emphasis areas

Production	Processing	Science	Economic / Social	Retail / Consumer
ANSC 222 Meat Animal Evaluation	ABEN 263 Biological Materials Processing	BIOL 440/640 Microbial Ecology	AGEC 375 Applied Agricultural Law	BUS 460 Consumer Behavior
ANSC 482 Sheep Industry and Production Systems	ABEN 458 Food Process Engineering	CFS 474 Sensory Science of Foods	ECON 472 International Trade	HNES 270 Consumer Issues in Food and Nutrition
ANSC 484 Swine Industry and Production Systems	ANSC 330 Meat Selection, Grading, and Judging	MICR 363 Clinical Parasitology	AGEC 484 Agricultural Policy	HNES 261 Food Selection and Preparation Principles
ANSC 486 Beef Industry and Production Systems	ANSC 344 Fundamentals of Meat Processing	MICR 452/652 Microbial Ecology	ADFH 411 Food and World Cultures	HNES 261L Food Selection and Preparation Principles Laboratory
ANSC 488 Dairy Industry and Production Systems	CE 410 Water and Wastewater Engineering	MCIR 453/653 Food Microbiology	COMM 433/633 Legal Communication	HNES 361 Food Production Management
MICR 465/665 Fundamentals of Animal Disease	CFS 430 Food Unit Operations	MICR 454/654 Bioprocessing	COMM 443/643 Mass Media and Public Opinion	HNES 361L Food and Production Mgmt Laboratory
MICR 475/675 Animal Virology	CFS 431 Food Unit Operations Laboratory	MICR 460/660 Pathogenic Microbiology	SAFE/COMM 485 Crisis Communication in Public Relations	HNES 460 Foodservice Systems
PS 110 World Food Crops (CCN)	CFS 480 Food Product Development	MICR 470/670 Basic Immunology	STAT 462/662 Introduction to Experimental Design	HNES 460L Foodservice Systems Laboratory
PS 360 Horticultural Food Crops		PPTH 460/660 Fungal Biology		

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