

SAFE EATS: AN EVALUATION OF THE USE OF SOCIAL MEDIA
FOR FOOD SAFETY EDUCATION

by

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(Under the Direction of Judy A. Harrison)

ABSTRACT

Many undergraduate students are cooking for the first time, and they need to learn safe food practices to reduce their risk of foodborne illness. Social media tools are being utilized to teach, but limited research has examined their effectiveness for food safety education. The purpose of this study was to develop and evaluate a social media-based intervention to improve young adults' food safety attitudes, practices and knowledge. Preliminary surveys and online focus groups were conducted to guide intervention design. College students (710) were included in treatment and control groups. Results from pre-tests and post-tests indicate participation in the "Safe Eats" Facebook intervention leads to improvements in food safety attitudes, practices and knowledge. Although students perceived learning more from the intervention, traditional lecture improved knowledge scores more than the intervention alone. However, participants who spent more time on the Facebook page showed greater improvements in food safety attitudes and practices.

INDEX WORDS: food safety education, social media, Facebook, online focus groups

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EDUCATION

by

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DEDICATION

This paper is dedicated to my loving and supporting parents, Joey and Phyllis Faircloth, who never fail to encourage me and have instilled in me the benefits of hard work and education.

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CHAPTER 1

INTRODUCTION

Many undergraduate students are cooking for themselves for the first time, and young adults are more likely to engage in risky eating behaviors (Byrd-Bredbenner et al., 2008). Although young people are not considered an “at-risk” population for severe complications, cases of foodborne illness in this population are more likely to go unreported. The Centers for Disease Control and Prevention (CDC) estimate that one out of every six Americans become sick from foodborne illness with 128,000 hospitalizations and 3,000 deaths per year (Scallan, Griffin, Angulo, Tauxe, and Hoekstra, 2011). Over the last quarter century, lifestyle changes have limited the opportunities for young people to learn safe food handling techniques (Byrd-Bredbenner et al., 2007c). Families’ reliance on convenience, fast food, and restaurant foods limits opportunities for young people to learn via observation of food preparation at home, while secondary schools have reduced or even eliminated family and consumer science courses that once taught food safety.

An increasing number of Americans look to the Internet as a source for food safety information, and this trend is likely to continue (Jacob et al., 2010). Students have indicated interest in receiving food safety information through electronic media, and nutrition education interventions have shown that online materials were “more thoroughly read, recalled, and viewed as personally relevant as compared to traditional, print-based materials.” (McArthur, Holbert and Forsythe, 2007; Park et al., 2008). Many food safety educators are beginning to employ

social media to communicate messages, but evaluation of this technique has been limited to quantitative data such as metrics related to site visits and clickthroughs.

The main purpose of this research was to develop and evaluate a social media-based food safety intervention intended to improve attitudes, practices, and knowledge of food safety. The research questions for this study were “Do college students know how to safely handle foods to reduce risk of foodborne illness?” and “Is a social media application an effective way to teach college students about safe food handling practices?” The overall hypotheses were: (1) college students lack knowledge about safe food handling and engage in food handling practices that put them at risk for foodborne illness; and (2) food safety education offered in a social media environment will improve the knowledge, attitudes, and behaviors related to food safety in college students. The overall hypotheses were tested with students at the University of Georgia in 2010. The specific aims were as follows.

Specific Aim 1. Adapt a previously validated questionnaire to use as a survey to assess baseline knowledge, attitudes, and behaviors related to food safety in college students, as well as their preferred methods of learning.

Specific Aim 2. Conduct online focus groups to determine the appropriate format for a social media-based food safety education intervention.

Specific Aim 3. Develop an online food safety education intervention that focuses on safe food storage, improved handling practices, and ways to prevent foodborne illness based on key messages from the Fight BAC![®] Food Safety Education Campaign of The Partnership for Food Safety Education (2010) and the Be Food Safe Campaign from the United States Department of Agriculture - Food Safety and Inspection Service (2010).

Specific Aim 4. Conduct pre-tests and post-tests with college students in both treatment and control groups to evaluate the efficacy of “Safe Eats”, a Facebook fan page devoted to food safety education.

CHAPTER 2

LITERATURE REVIEW

Impact of foodborne illness

The Centers for Disease Control and Prevention (CDC) estimate that one out of every six Americans become sick from foodborne illness with 128,000 hospitalizations and 3,000 deaths per year (Scallan et al., 2011). Known foodborne pathogens and unspecified agents such as microbes and chemicals cause approximately 47.8 million cases of foodborne illness each year in the United States. Limitations to these estimates stem from underdiagnosis and underreporting of mild cases of foodborne illness and early spontaneous abortions related to undiagnosed listeriosis. Individuals with gastrointestinal symptoms are unlikely to seek medical care (~12-21%), and individuals are even less likely to provide a stool sample to be used for identification purposes (~2.5-3.8%) (Kaptan and Fischhoff, 2011). Norovirus is estimated to be associated with large numbers of cases, and the virus is highly contagious and most notably spread by food handlers (CDC, 2011a). The seriousness of foodborne illness should not be underestimated as sickness can lead to long-term complications such as: rheumatoid disease, thyroid disease, inflammatory bowel disease, renal disease, neuromuscular disorders, immunity disorders, organ impairment, and neurologic disorders (Lindsay, 2007). Robert Scharff, as part of the Produce Food Safety Project, estimates the mean annual cost of foodborne illness in the United States to be 152 billion dollars (Scharff, 2010). This estimate is based on the health-related costs of foodborne illness, and does not include the substantial costs of foodborne illness for industry and government agencies. The Department of Health and Human Services has identified the

importance of food safety with the inclusion of food safety in the Healthy People 2020 objectives (U.S. Department of Health and Human Services, 2010). One of the key objectives on an individual level is to “increase the proportion of consumers who follow key food safety practices” such as the four key food safety practices of clean, separate, cook, and chill as presented in the Fight BAC![®] Food Safety Education Campaign of The Partnership for Food Safety Education (2010) and the Be Food Safe Campaign from the United States Department of Agriculture - Food Safety and Inspection Service (2010). President Obama created the President’s Food Safety Working Group in March 2009, and the group is recommending a new, public health-focused approach to food safety based on three core principles: prioritizing prevention, strengthening surveillance and enforcement, and improving response and recovery (President’s Food Safety Working Group, 2009). The changing consumption pattern of Americans leads to an even greater cause for concern, and as our food supply has shifted from local to global, risks of contamination have also increased (Galson, 2009). Unlike commercial kitchens, home kitchens have many different uses other than food preparation, and can easily be contaminated with pathogens carried by humans, pets, and insects (Medeiros et al., 2004). Home kitchens are the final line of defense against foodborne illness in the farm to table continuum, and educated food preparers are key to minimize contamination, control bacterial growth, and cook foods to safe internal temperatures to eliminate pathogens.

College students and food safety

Many undergraduate students are cooking for themselves for the first time, and young adults are more likely to engage in risky eating behaviors (Byrd-Bredbenner et al., 2008). Although young people are not considered an “at-risk” population for severe complications, cases of foodborne illness in this population are more likely to go unreported. Additionally, students have

an increased risk of gastrointestinal distress due to a number of factors including excessive alcohol consumption, stress, anxiety, antibiotic use, and intolerance to certain food additives (Morrone and Rathbun, 2003). Over the last quarter century, lifestyle changes have limited the opportunities for young people to learn safe food handling techniques (Byrd-Bredbenner et al., 2007c). Families' reliance on convenience, fast food, and restaurant foods limits opportunities for young people to learn via observation of food preparation at home, while secondary schools have reduced or even eliminated family and consumer science courses that once taught food safety. Individuals, especially college students, often eat on the go, and foods are often stored unrefrigerated in cars and backpacks (Byrd-Bredbenner et al., 2007b). Byrd-Bredbenner et al. (2007b) concluded that educational messages targeted specifically to young adults are needed to address key issues such as temperature regulation and cleanliness. In a study where college students' home kitchens were audited, several risk factors for foodborne illness were observed. Students' refrigerator temperatures were found to be higher than recommended, which can sustain foodborne pathogens such as *Staphylococcus aureus*, *Listeria monocytogenes*, and *Yersinia enterocolitica* (Byrd-Bredbenner et al., 2007a). Only 7% of students had a food thermometer in their home kitchen, and a thermometer is recommended to tell if food is safely cooked. Researchers noted the unsanitary state of students' kitchen appliances, and clean food contact surfaces are key to prevent contamination. McArthur, Holbert, and Forsythe (2007) found a lack of compliance with food safety practices among college students including hamburger cooking, hand washing, covering cuts and burns, and observing microwave stand times. College students tend to place the responsibility for food safety on external bodies, such as the government agencies and restaurants (Unklesbay, Sneed, and Toma, 1998). Redmond and Griffith (2004) noted that individuals must accept personal responsibility for food safety before

they will make any changes in their behaviors. Survey respondents often indicate that foodborne illness is caused by food prepared outside of the home, but studies have shown that most cases of foodborne illness result from home-prepared foods (Fein et al., 1995). Consumers' beliefs about the origin of foodborne illness may serve as a barrier to behavior change, while a greater perceived risk of foodborne illness is associated with a greater concern for food safety issues. Individuals often underestimate the potential serious implications of foodborne illness, and this perception also serves as a barrier to behavior change. Unklesbay et al. (1998) concluded that a lack of understanding and knowledge of safe food handling affects both perception and practice, and these individuals are more susceptible to misinformation. Researchers found that improving knowledge has led to some changes in food safety practice, including reduced consumption of high-risk foods and increased usage of thermometers (Yarrow, Remig, and Higgins, 2009). Individuals also make risk-benefit decisions when it comes to food safety, and they will often ignore known risks for certain foods or food preparations that they find desirable (McCarthy et al., 2007). Morris and Penhollow (2005) concluded that improving students' knowledge of safe food handling practices would help them realize the risks and susceptibility of foodborne illness, and they recommended that safe food handling should be incorporated into university health curriculums. The reality is that food safety is often overlooked in university health curriculums, and the information is important for individuals in this stage of life (Morrone and Rathbun, 2003). Unklesbay et al. (1998) found that only one third of their college-aged research participants had been exposed to food safety information, yet over two-thirds claimed they were interested in the topic of food safety. Researchers identified that education is key to helping the public make informed decisions, and college students are an especially important target population as they may soon have roles as caretakers of higher risk audiences such as infants,

children and older adults and often have part-time employment in the food service industry (Unklesbay et al., 1998; Stein, Dirks, and Quinlan, 2010).

Surveys in education

In order for communication to be effective, food safety education messages should be targeted to the needs and attitudes of the population (Jacob, Mathiasen, and Powell, 2010). Researchers assert that effective communicators must look at the public perception of the hazard, their knowledge and behaviors regarding the involved risks, and the motivation behind acting on the hazard. Personalization of curriculum is a precursor to effective education and individual action. Surveys allow researchers to determine the population's knowledge and opinions towards both food safety and learning. Both knowledge and attitudes are precursors to behavior change, and the knowledge and attitudes of participants are key to determine potential for changes in practice (Medeiros et al., 2004). Knowledge and skills for safe food handling prepare individuals to make changes in food handling practices. Attitude scales are predictive of behavior outcomes as attitude provides the motivation to make changes, and these scales are useful to assess food safety education interventions. Surveys allow researchers to collect both qualitative and quantitative data to prioritize the needs of the target audience and design an effective educational intervention (Strolla, Gans, and Risica, 2006).

Online focus groups

Online focus groups provide an alternative outlet to reach audiences who are unable and/or unwilling to participate in traditional face-to-face focus groups (Fox, Morris, and Rumsey, 2007). Young people tend to have erratic schedules, some limited access to transportation, and may be uncomfortable meeting a group of strangers at an unfamiliar location. These barriers present challenges in conducting traditional focus groups. In the lives of young adults, the

Internet is a primary means of information gathering, entertainment, and communication. Synchronous online communication is common place for young adults in chat rooms and through instant messaging and social networking sites. Chat rooms still carry some stigmas related to predatory adult interactions with young people, so online focus groups should be held in sites that are familiar to the audience and are considered safe by the audience. Online focus groups allow researchers to recreate the same immediacy and expression found in traditional focus groups (Fox et al., 2007). The moderation of online focus groups requires an individual with fast typing skills and some experience with this type of real-time discussion. Online focus groups move fast, and allow individuals to defy the conversational “turn-taking”. Group size should be small to allow for a conversational style discussion, and very large groups would cause problems for moderating. The online nature creates a sense of anonymity in the focus groups that allows individuals to communicate more candidly. Limitations to this type of communication include limited nonverbal cues, yet young adults tend to use emoticons and abbreviations to express general feelings (Fox et al., 2007). Contributions may be more superficial than those offered in a traditional focus group as the pace is faster and more informal. Research has found that synchronous online focus groups are both insightful and engaging and are useful tools for qualitative research. Researchers suggest allowing target audiences to choose the appropriate communication channels and media for delivering messages (Jacob et al., 2010). Online focus groups allow the opportunity to have an open discussion about how individuals prefer to receive messages as well as their preferences for different types of media. Research suggests that tailored messages are more effective than traditional health information strategies (Jacob et al. 2010).

Logic model use in program development

Logic models are effectively used to present a framework for educational interventions (Israel, 2001). Logic models afford researchers the opportunity to think through the plans and make assumptions about how programs will work. Some researchers assert the importance of starting with the end; in other words, program developers should focus on the intended outcomes. Logic models are often presented as diagrams showing the major components of the program and the linkage of events needed for the program to be effective. Inputs involve the resources afforded to the program and contributions needed in terms of staff and materials (Goldman and Schmalz, 2006). Outputs lay out the activities, services and products of the intervention intended for participants. Outcomes are generally divided into three categories: short-term, intermediate, and long-term. Long-term outcomes involve changes of a larger scale in social, economic and environmental conditions, while intermediate outcomes generally include a deeper understanding and adoption of best practices. Short-term outcomes are direct effects of the intervention that may include changes in knowledge, attitudes or skills. Outcomes, especially short-term, should be clear and measurable as they provide the basis for program evaluation (Goldman and Schmalz, 2006).

Education and new media

Web 2.0 is an umbrella term used to describe the range of new Internet tools, technologies and practices that are connecting people around the world and becoming mainstream in the 21st century (Selwyn, 2009). Enhanced motivation and interest may be stimulated by the use of web 2.0 technologies, and young people need a combination of both motivation and interest to improve their food handling practices. The use of the Internet in education can transform education from being “a special activity that takes place in a special place at special times” into a

context where students are learning for the sheer pleasure of learning. The use of web 2.0 tools in education allows the student and the instructor more flexibility and promotes the idea of a user-driven education. Neomillennial students (those born after 1982) comprise the majority of the students enrolled in universities today, and the technologies that they grew up with will shape both their learning styles and expectations (Baird and Fisher, 2005).

The social learning theory suggests that cognitive development is dependent on the social interaction of the learner. Instruction should engage students in tasks within the social learning environment with appropriate levels of guidance. Social networking sites can allow educators an opportunity to give students social interaction as well as give them guidance and supplemental activities in which to partake. Social constructivism is an appropriate pedagogical approach to food safety education using social networking, and this theory promotes meaningful learning in a social environment where students engage in learning tasks that elicit generating and sharing ideas as well as reflecting (Woo and Reeves, 2007). Social networking sites are appropriate for this type of learning because they can provide an outlet for both learning tasks and social interaction.

Over the last 20 years, the Internet has transformed the lives of Americans in many ways including the way people interact and learn. Ninety-three percent (93%) of young adults (age 18-29) are using the Internet, and 68% of all adult Internet users go online everyday (Lenhart, Purcell, Smith and Zickuhr, 2010). Seventy-two percent (72%) of young adults are accessing health information online, and this practice is consistent with teens and adults in the 30-49 age range. The Internet is viewed as a reliable source of health information, and approximately 75% of online health information seekers do not consistently check for sources and dates of information (Bennett and Glasgow, 2009). This finding is somewhat concerning and affirms the

need for experts to be at the forefront of online health education. Seventy-two percent (72%) of young adults use social networking sites, and 71% of this population has a Facebook profile (Lenhart et al., 2010). Facebook appears to be the most popular social networking site with 45% of young adult users logging in daily. Facebook was created for college students, and initially required an “.edu” email address for registration (Joinson, 2008). In the fall of 2006, Facebook opened registration to all online users, and quickly became the most popular social networking site. Facebook is used primarily for two activities: “social searching” and “social browsing”. “Social searching” involves researching contacts established offline, while “social browsing” involves meeting someone on the site with the intention of an offline meeting. Young adults are utilizing other social networking sites including: LinkedIn (7%) and MySpace (66%). MySpace is similar to Facebook in terms of user activity, but users are allowed more creativity in creating custom profile pages. MySpace has appeared to lose some momentum due to stigmas related to child predators and an inability to successfully control spam. MySpace remains a popular choice for new musicians to promote their work. LinkedIn is a professionally-orientated social networking site allowing users to connect with others and maintain an online resume complete with user recommendations (Lenhart et al., 2010). Both blogging and microblogging provide outlets for young adults to express themselves; 37% of young adults use Twitter or other similar status-updating sites and 11% maintain blogs. Seventy-eight percent (78%) of young adults are watching videos online with 38% of all adults tuning in to educational videos online (Purcell, 2010). YouTube is a public web-based video sharing site where over 100 million video clips are viewed, and 65,000 videos are uploaded daily (Burke and Snyder, 2008). Research suggests that college-aged students may find YouTube videos to be more engaging than lecture-based messages, and learners have enjoyed searching for YouTube videos related to course topics.

Health and food safety-related videos can easily be found on YouTube and are viewed as good educational resources for both instructors and students. In recent years, social networking sites have become communication platforms for health promotion efforts, and these sites promote a consumer-centered climate where individuals can share ideas (Chou, Hunt, Beckjord, Moser and Hesse, 2009). The CDC has a strong health marketing effort and is actively communicating messages through social networking sites and other new media tools. The CDC Facebook site is updated multiple times a day with a variety of educational resources available for followers. Although the CDC's efforts are widespread, CDC to consumer interaction appears to be limited, and this may be related to policies requiring review of posted messages and replies. The CDC has made efforts to evaluate their social media use, but the evaluation is limited to metrics related to site visits, clickthroughs, and Facebook insights (CDC, 2011b). Many other food safety educators are using social media to disseminate information including: The Partnership for Food Safety Education (PFSE, <http://www.facebook.com/#!/FightBAC>), U.S. Department of Agriculture (USDA, <http://twitter.com/usdafoodsafety>), and U.S. Food and Drug Administration (FDA, <http://www.facebook.com/#!/FDA>).

An increasing number of Americans look to the Internet as a source for food safety information, and this trend is likely to continue (Jacob et al., 2010). The Internet can help to reduce costs and time associated with an education intervention, as well as reduce error related to data collection and reporting (Park et al., 2008). Initial development costs of Internet interventions may be high, but maintaining public health efforts online is believed to have lower overall costs (Bennett and Glasgow, 2009). Students have indicated interest in receiving food safety information through electronic media, and nutrition education interventions have shown that online materials were "more thoroughly read, recalled, and viewed as personally relevant as

compared to traditional, print-based materials.” (McArthur et al., 2007; Park et al., 2008). In a review of web-based health behavior and education interventions, researchers found that participants in web-based interventions show significant improvements in knowledge achievement and behavior change when compared to traditional programs (Wantland, Portillo, Holzemer, Slaughter, and McGhee, 2004). Computer based training has proven to be as effective as lecture in improving knowledge and attitudes related to food safety (Beffa-Negrini, Cohen, Laus, and McLandsborough, 2007). Online learning environments can broaden learning opportunities due to their independent, self-paced, flexible nature (Pintauro, Krahl, Buzzell, and Chamberlain, 2005). Pintauro et al. (2005) found that a web-based food safety and regulation course for college students was as effective as a comparable lecture-based course.

Communication in an online forum must be persuasive, as these types of messages can provide individuals with internal cues to change their behaviors (Cassell, Jackson, and Chevront, 1998). Persuasive messages are interesting to the audience, solicit feedback from the audience, and encourage. Food safety messages should be clear, persuasive and personally relatable (Jacob et al., 2010).

CHAPTER 3

METHODS

Preliminary survey of college students' safe food handling knowledge, attitudes toward food safety and food safety practices

A preliminary survey (Appendix A) was developed and administered to examine students' knowledge of food safety, attitudes toward food safety and foodborne illness and their food safety practices; to identify types of social media used by college students; and to determine what social media applications college students would use for food safety information. The attitude scale and questions were adapted from Unklesbay et al. (1998) and address the ideas of personal responsibility for food safety and concern for foodborne illness. The practice questions were used to determine the types of food handling practices that are more common among the target population. The knowledge questions helped to identify existing gaps in education and focus areas for the future. To ensure content validity, published survey questions that had been previously validated with a similar audience were used as the basis for the survey (McCarthy et al. 2007; Unklesbay et al. 1998) and adapted for use in this study. In addition, a panel of experts (faculty and Extension food safety educators from four universities at various locations nationwide, the director of a university survey research center, an evaluation specialist, the director of a statistical consulting center, and two graduate students) reviewed the questions and response scales and provided feedback for improvement. A convenience sample of students was recruited from introductory foods and nutrition classes (FDNS 2100) and an introductory housing and consumer economics course (HACE 2100) at the University of Georgia to

participate in preliminary surveys. Students in these classes typically represent a large spectrum of non-foods majors as both are popular elective courses on campus. No incentive was offered for participation in the preliminary survey. Informed consent was obtained from participants using an approved consent letter (Appendix A) that was posted as the first page of the preliminary survey. Approval from the Institutional Review Board of The University of Georgia was obtained for all questionnaires, recruitment materials and methods used with human subjects in this study. The preliminary survey was administered in an online format using SurveyMonkey™ in the spring of 2010. Recruitment for the survey began with a visit to three sections of FDNS 2100 and one section of HACE 2100; handouts were given as an invitation to participate in the survey. Reminder emails were sent to students through E-Learning Commons (ELC) four days following the presentation of the survey invitation in an effort to ensure a maximum response rate. A link to the survey was posted to the ELC website, and the survey was completed by students before their class food safety lecture. Descriptive statistics were calculated for each of the attitude, practice, knowledge and demographic questions using PASW (Version 18.0). Knowledge test scores were calculated out of a total score of 35 and converted to a percentage; each question choice was counted as a right or wrong answer. Pearson correlations were calculated to determine the relationship between knowledge scores and demographic variables. The outcomes of the survey identified food safety knowledge and safe practices lacking in college students and types of social media used by the target audience.

Online focus groups

Online focus groups were conducted in the summer of 2010 to determine the appropriate food safety messages to include along with preferences for how this information should be presented in a social media environment. Participants in the focus groups were students in a similar section

of FDNS 2100, and the class was visited to advertise the opportunity. Participants were also recruited via ELC messages and announcements. Extra credit was offered for participation in the online focus groups; and as per the requirements of the Institutional Review Board, a separate task for extra credit was available for those who did not wish to participate in the study. For the online focus group participants, the consent letter (Appendix B) was posted on E-Learning Commons (ELC) as an assessment that was required for participation, and in the assessment, students selected the group time that they were available to participate. Students were asked to participate in online focus groups administered using the chat room on ELC. Four online focus groups took place in the evening hours on both weekdays and weekends, and interested participants were all able to find a day and time that met their needs. Students in the focus groups had already received a food safety lecture and were somewhat familiar with safe food handling. A script was created as a moderator's guide (Appendix B), and students were first introduced to the focus group and given a brief synopsis of the types of questions to be asked. The opening question invited participants to look back at their food safety lecture and identify the safe food handling practices that were most important to them personally. Students were subsequently asked their ideas for disseminating food safety information and for communicating the key food safety messages: clean, separate, cook and chill. Students were also asked about their experiences with education in a social media environment, and how they felt social media could be used for education. Students were asked for their opinions on recipe demonstrations and Facebook fan pages; additionally students were asked to identify the types of educational messages that they felt would work best in a social media environment. Lastly, students were asked what sources they would use to look for food safety information. The moderator's guide also included potential follow-up questions depending on students' responses. At the conclusion

of all focus groups, transcripts were reviewed and common themes were identified. Frequency of themes was recorded using Microsoft Excel 2007 (Version 12). The outcomes of the focus groups were used to help design the curriculum for an online food safety education intervention for college students.

Curriculum development

The conceptual framework for the evaluation tools and the intervention were the four key food safety messages of clean, separate, cook and chill to reduce risk of foodborne illness as presented in the Fight BAC![®] Food Safety Education Campaign of The Partnership for Food Safety Education (2010) and the Be Food Safe Campaign from the United States Department of Agriculture- Food Safety and Inspection Service (2010). Preliminary surveys and online focus groups were used to determine food handling practices that needed a heightened focus in the curriculum. A logic model (Appendix F) was developed to guide the development of the intervention and evaluation. A Facebook fan page for the online food safety education intervention was developed. Four food safety videos were written, filmed, and produced for use on the Facebook fan page. Introductions to each video were created with Final Cut Pro Academic (Version 7.0.3). The first video presented was a PowerPoint-based food safety game show entitled “Food Safety Feud.” This video was created in Microsoft Office PowerPoint 2007 (Version 12) and edited and produced using Microsoft Windows Movie Maker (Version 2.1). The game show presented information on foodborne pathogens such as bacteria, viruses and parasites and spoilage organisms such as molds along with foodborne illness information and statistics. The game also introduced the four key food safety messages of clean, separate, cook and chill. The remainder of the videos were filmed using a Flip HD video camera (Flip ultraHD) and were edited and produced using iMovie '09 (Version 8.0). A “Food Safety Game

Plan” video was developed to focus on outdoor cooking and food safety information related to tailgating at sporting events. Concepts presented in the video included: temperature danger zone, cooler use, use of appliance thermometers, prevention of cross-contamination, measuring internal temperature of ground beef to ensure adequate cooking and use of food thermometers. The next video was presented as a Food Network-style recipe demonstration focusing on food safety in food preparation. An easy chicken fajita recipe was demonstrated and concepts included handwashing, prevention of cross-contamination, safe marinating procedures, appropriate refrigerator temperature, use of food thermometers, and measuring internal temperature of chicken to ensure adequate cooking. The final video was developed to address common food safety questions presented by students in the surveys and focus groups. The “Kitchen Q&A” video covered cleaning and sanitizing procedures, recommended refrigerator temperature, use of appliance thermometers, proper food storage procedures, safe thawing methods and safe handling of leftovers. Four polls were developed on the topics of the temperature danger zone, microwave stand time, appliance thermometers, and refrigeration of deli meats. Five food safety updates were developed to address egg safety, microwave food safety, what to do in a food recall, expiration dates on packages, and continued food safety learning. Risk communication was an essential component of the curriculum as perceived risks are essential to make attitude and practice changes. The final component of the curriculum was not designed, but rather encouraged. Discussion boards and the Facebook wall were intended for participants to ask their own food safety questions, and after postings, questions were presented to stimulate discussion about the topic at hand. The “Safe Eats” Facebook page was created as a fan page and photographs from the USDA’s Kitchen Companion (2008) were used to illustrate

safe food handling practices. All developed curriculum materials were posted on Facebook over a period of four weeks, and the entirety of the curriculum was student-driven.

“Safe Eats” food safety education intervention

The education intervention was implemented and the impact was evaluated using a quasi-experimental design, in which different sections of FDNS 2100 were assigned to control and treatment groups (Table 3.0). In order to maximize participant numbers, the project was conducted in two phases. Demographic data such as gender, living situation, frequency of meal preparation, food service work experience and additional food safety learning experiences were collected to determine the characteristics and homogeneity of the target audience. In phase one of the project, two sections of FDNS 2100 acted as “treatment group 1” with access to the “Safe Eats” Facebook page and received a standardized food safety lecture, and another section of FDNS 2100 (control group 1) only received the standardized food safety lecture. During the first phase of the project, standardized food safety lectures were given during the four week period of time between the pre-test and the post-test. In phase two of the project, an additional two sections of FDNS 2100 acted as “treatment group 2” that received access to the “Safe Eats” Facebook page only, and another section of FDNS 2100 acted as “control group 2” and received no food safety instruction. Recruitment took place through classroom visits, handouts and ELC messages (Appendix C, D and E). Extra credit was offered for participation in both the treatment and control groups; and as per the requirements of the Institutional Review Board, a separate task for extra credit was available for those who did not wish to participate in the study. In both phases of the project, treatment and control groups completed consent forms (Appendix C, D, and E) posted as the first pages of their online pre-tests. Pre-tests were administered through SurveyMonkey prior to participation in the treatment or control groups, and the pre-tests were

adapted from the original survey used in the spring of 2010. The pre-test was used to gather information about the students' food safety knowledge, attitudes, and current practices as well as demographic information. Upon completion of the intervention, the same test was administered to participants as a post-test using SurveyMonkey to determine changes in knowledge, attitudes and practices related to safe food handling as a result of the social media intervention.

Additional questions were included for treatment groups to determine attitudes toward the effectiveness of the Facebook page for food safety education and individual components of the intervention. "Treatment group 1" participants were asked to compare their experience with the "Safe Eats" Facebook fan page and the food safety lecture. Open-ended questions were included to identify any additional changes in food handling practices participants intended to implement as a result of their participation, and for students to suggest improvements for the "Safe Eats" intervention.

The distribution of demographic characteristics for all four groups was initially recorded. Attitude, practice, and knowledge scores were calculated for all groups' pre-tests and post-tests. Food safety attitudes were measured on a scale of 1 to 5 (1 = strongly disagree, 5 = strongly agree, 5 always being the most food safety conscious choice), and participant scores were averaged from a series of 4 attitude variables. Food safety practices were measured on a scale of 1 to 5 (1 = never, 5 = always, 5 being the most food safety conscious choice), and participant scores were averaged from a series of 12 food safety practices. For food safety practice questions, an option of "does not apply" was available for respondents, and participants who chose "does not apply" received the average score of all participants for that particular question. In both the practice and attitude portions of the test, individuals who did not answer the questions also received the average score for that particular question. The knowledge scores were

calculated as a percentage of correct and incorrect answers based on a 35 point test. For analysis the percentage scores were recorded on a scale of 0.00 to 1.00.

SAS (Version 9.2) was used to calculate analysis of variance, independent means t-tests, and paired t-tests for the intervention data. Analysis of variance (ANOVA) procedures were used to determine if attitude, practice and knowledge pre-test scores were different among the groups as a way to determine the homogeneity of the groups. ANOVA and independent means t-tests were used to determine the effect of demographic variables on pre-test scores (ANOVA with 3 or more groups and independent t-tests with only two groups). Next paired t-tests were used to determine differences among pre-tests and post-tests in all three areas (attitudes, practice, and knowledge). Differences were analyzed using independent means t-tests and ANOVA to determine if any demographic variable had an effect on change in score. The differences were then analyzed using ANOVA to determine if any group's improvements were greater than any other group's improvement, and Tukey's pairwise comparison tests were used to detect where the groups diverged. During the course of analyses, each of the treatment groups was broken down into two different groups based on self-reported data related to the time the participant spent on the Facebook page (those who used the Facebook page more than 15 minutes per week and those who used it less). This separation was based on the statement in the promotional handout where participants were asked to spend at least 15 minutes per week on the site, and this was hypothesized to correlate with better performance on the post-tests. Descriptive analyses were calculated using PASW (Version 18.0) for the treatment groups' answers to questions about the intervention and the comparison between the intervention and lecture. Intended food safety practices were grouped into themes based on the four key food safety messages of clean, separate, cook, and chill, and frequency of each theme was recorded.

Table 3.0 – Summary of activities available to groups of college students participating in a food safety education study

Group	Food Safety Lecture?	Access to Facebook site?	15 minutes on Facebook site per week?
Preliminary survey group(S)	No	No	N/A ^a
Online focus group (O)	Yes	No	N/A ^a
Treatment group 1(LF) ^b	Yes	Yes	No
Treatment group 1 (LF15) ^b	Yes	Yes	Yes
Control group 1 (L) ^c	Yes	No	N/A ^a
Treatment group 2 (F) ^b	No	Yes	No
Treatment group 2 (F15) ^b	No	Yes	Yes
Control group 2 (C) ^c	No	No	N/A ^a

^aThis activity was not applicable to this group.

^bDuring the course of analyses, each of the treatment groups was broken down into two different groups based on self-reported data related to the time the participant spent on the Facebook page. This separation was based on the statement in the promotional handout where participants were asked to spend at least 15 minutes per week on the site, and this was hypothesized to correlate with better performance on the post-tests.

^cControl group participants differed by their access to a food safety lecture. Control group 1 received a food safety lecture, while control group 2 acted as a true control receiving no food safety information.

CHAPTER 4

RESULTS AND DISCUSSION

Food safety knowledge, attitudes, and practices of college students identified by preliminary surveys

Ninety-three (93) respondents (15 male, 78 female) completed the preliminary surveys in the spring and summer of 2010. The basic demographics of the survey group can be found in Table 4.0, and the percentages for living situation, years lived away from home, and frequency of meal preparation can be found in Tables 4.1, 4.2, and 4.3 respectively. Respondents' knowledge scores varied from 50.0% to 98.9% with a mean of $75.7\% \pm 10.6\%$. Percentages for attitude and practice variable responses can be found in Tables 4.4 and 4.5 respectively. No significant ($p < 0.05$) correlations were found between knowledge score and gender; knowledge score and years lived away from home; knowledge score and restaurant work experience; knowledge score and major in dietetics, nutrition, food science or food-related major; or knowledge score and participation in class or club where safe food handling was taught. Weak positive correlations were found between knowledge score and living situation ($0.270, p = 0.009$) and between knowledge score and frequency of meal preparation ($0.275, p = 0.008$). Students were asked a series of questions to determine social media usage (Figure 4.0), likelihood of social media usage for food safety information (Figure 4.1), barriers to social media usage for food safety information (Figure 4.2), and identification of sources college students would use for food safety information (Figure 4.3). The majority of students surveyed (96.8%) had a profile on Facebook compared to 17.2% on MySpace, 11.8% on LinkedIn, and 25.8% on Twitter. Participants were

least likely to use podcasts and MySpace for food safety information, and were more likely to use Facebook and YouTube for food safety information. The most frequently identified barrier to accessing food safety information through social media was a lack of time (55.9%) followed by the belief that he/she has the knowledge to keep food safe (40.9%). Some students (35.5%) cited a lack of interest in food safety education as a barrier to access. Only 3.2% of participants identified a dislike to social media as a barrier to access, while 21.5% cited a lack of susceptibility to foodborne illness as a barrier.

Outcomes of online focus groups to design the food safety intervention

A total of 38 students participated in the four online focus groups. All participants were enrolled in a food and nutrition course and had received a food safety lecture. Participant responses to a series of six questions, and commonly identified themes for each question can be found in Figures 4.4-4.8. In terms of food safety messages identified by college students as being important (Figure 4.4), participants identified “preventing cross-contamination” and “time foods can be held at room temperature” most frequently. Videos were the most preferred delivery method for food safety education (Figure 4.5), and YouTube was most frequently identified as an effective tool for food safety education using social media (Figure 4.6). Videos were also identified as the most preferred method for food safety education on a Facebook fan page (Figure 4.7); games, polls, recipes, and advertisements were commonly identified as well. When asked about where they would go to access food safety information (Figure 4.8), most students identified internet-based resources such as: Google (13), Wikipedia (1), YouTube (5), Blogs (1), Discovery Health (1) and the Internet in general (13). Food Network (7), medical professionals (4), print-based media (4), and family (7) were also identified as potential sources of food safety information. Participants were asked how they felt about integrating food safety

education into a recipe demonstration and 37 of the 38 students felt this would be an effective means for delivering food safety education.

Outcomes of the “Safe Eats” food safety education intervention

Over the course of two semesters, a total of 710 students were included in treatment and control groups. The basic demographics of all groups can be found in Table 4.0, and the percentages for living situation, years lived away from home, and frequency of meal preparation can be found in Tables 4.1, 4.2, and 4.3 respectively. Food safety attitude, practice and knowledge scores were assessed through online pre-tests open for a period of two weeks before the intervention period and online post-tests open for two weeks after the intervention period can be found in Tables 4.6, 4.7, and 4.8 respectively. No significant differences were found among the treatment and control groups’ attitude, practice, or knowledge scores at the time the pre-test was administered. No significant difference was found between pre-test attitude or knowledge scores of males and females, but females scored significantly higher on the pre-test practice measure than males (3.94 v. 3.74, $p=0.0001$). No significant differences were found in terms of pre-test practice or knowledge among participants who had participated in a class or club where safe food handling was taught, but these participants scored significantly higher on the attitude component (4.11 v. 3.99, $p=0.0206$). Participants with food service work experience were found to score significantly higher on both the practice (3.97 v. 3.86, $p=0.0020$) and knowledge (0.78 v. 0.76, $p=0.0076$) components of the pre-test, but no significant difference was detected in terms of the attitude variable. No significant differences were detected among living situation for attitude and practice variables at the time of the pre-test, but a significant difference was detected for the knowledge variable ($p=0.0033$). Using Tukey’s pairwise comparisons, individuals living in a shared apartment or house were found to score significantly higher than those who live in a

dorm room (0.78 v. 0.75). When examining the scores based on years lived away from home, no significant differences were found in terms of attitude, practice or knowledge on the pre-test. No significant difference was found in terms of food safety practice among groups with varying frequencies of meal preparation. Participants who never prepare foods had significantly lower attitude scores than individuals who prepare meals 4-6 times per week and more than 12 times per week (3.93 v. 4.16 and 4.19, $p=0.0044$). Participants who prepare meals 1-3 times per week had significantly lower knowledge scores than individuals who prepare 4-6 times per week on the pre-test (0.76 v. 0.79, $p=0.0211$).

Results of paired t-tests to determine if changes in scores over the intervention period were significant can be found in Tables 4.6, 4.7, and 4.8. The change in attitude score (Table 4.6) was found to be significant in all groups except control group 2. The change in practice score (Table 4.7) was found to be significant in all groups. The change in knowledge score (Table 4.8) was found to be significant in all groups except control group 2. In terms of attitude scores, the C (no lecture or Facebook) group scored significantly less than all other groups with the exception of L (lecture only) group. The L group scored significantly less on average than the LF15 (lecture and Facebook more than 15 minutes per week) group. In terms of practice scores, the L group scored significantly lower on average than F15 (no lecture, Facebook more than 15 minutes per week), F (no lecture, Facebook less than 15 minutes per week), and LF15 groups. The C group scored significantly lower on average than F and LF15 groups. The LF (lecture and Facebook less than 15 minutes per week) group scored significantly lower on average than the LF15 group. To account for the gender effect on food safety knowledge as identified by preliminary analyses, two-way ANOVA was used. Females' knowledge scores improved significantly more than males ($p=0.0291$). The C, F, and F15 groups are statistically similar in terms of knowledge, but

are all significantly different from the L, LF and LF15 groups. The distribution of time that participants spent on the “Safe Eats” Facebook page each week can be found in Figure 4.9. Results for each group’s evaluation of the usefulness of the different types of postings can be found in Figure 4.10. Videos appeared to be the most useful followed by wall messages, polls and the discussion board respectively. Findings from a series of questions to evaluate students’ learning and interest relative to the intervention are presented in Tables 4.9 and 4.10. Findings comparing Facebook and in-class lecture for treatment group 1 are presented in Table 4.9. High percentages of participants in treatment group 1 (98.2%) and treatment group 2 (97.1%) agreed with the statement, “as a result of my participation, I plan to change the way I handle foods.” Frequencies of the different themes identified by individuals who plan to change their food handling practices can be found in Figure 4.11. Popular responses included rinsing fruits and vegetables before eating, increasing frequency of handwashing, separating raw meats from other items while shopping, using a separate cutting board for raw meats, following microwave instructions including stand times, using a food thermometer to ensure foods are cooked, using a refrigerator thermometer, changing defrosting methods, and putting leftovers in the refrigerator sooner. Responses to a series of questions to determine the likelihood of continuing food safety education are presented in Table 4.11. Approximately half of participants in treatment group 1 (50.7%) and treatment group 2 (52.5%) indicated that they were either very likely or likely to use Facebook in the future to learn about a health or safety topic. Over 60% of treatment group 1 (62.4%) and treatment group 2 (66.5%) indicated that they were either very likely or likely to use the given online food safety resources (websites: www.fightbac.org, www.holidayfoodsafety.org, www.foodsafety.gov, and www.recalls.gov) in the future. High percentages of treatment group 1

(80.3%) and treatment group 2 (73.1%) indicated that they were either very likely or likely to share food safety information with others in the future.

Discussion

Preliminary survey results indicated that college students had limited knowledge of food safety and engaged in practices that put them at risk for foodborne illness. Lower knowledge scores are likely related to a lack of exposure to food safety education and opportunities to learn and practice safe food handling practices consistent with previous studies (McArthur, 2007). These scores support the hypothesis that “students lack knowledge of safe food handling.” A substantial portion of students did not agree with the statement, “I believe foodborne illnesses are common”, and this finding is cause for concern as researchers assert that improved food safety practices are related to a greater perceived risk of foodborne illness (Fein et al., 1995). The majority of students indicated an interest in food safety, and these findings are similar to results of a 1998 study examining the food safety attitudes, practices and knowledge of college students (Unklesbay et al., 1998). Food safety practices of particular concern included limited appliance thermometer use, improper reheating of leftover foods, limited adherence to recommended microwave stand times, failure to separate raw meats from ready-to-eat items while grocery shopping, failure to marinate foods in the refrigerator, failure to adequately cook eggs until they are firm, and irregular handwashing practices. Many of these practices have also been confirmed in other studies on the food safety behaviors of young adults (Bredbenner et al., 2007b; McArthur et al., 2007; Unklesbay et al., 1998). These practices support the hypothesis that “students engage in food handling practices that put them at risk for foodborne illness.” Findings from the preliminary survey in this study were used to build a curriculum tailored to the needs of the target audience, and tailored messages have been deemed more effective for food safety

education (Jacob et al., 2010). A majority of students surveyed indicated they had a profile on Facebook, while other social media sites had limited participation among the audience. In comparing participation rates of participants with that found in other research, participation in Facebook is inflated, while participation in MySpace is much less. The variance in social media use may be indicative of college students' usage as compared to young adults as a whole. Facebook was created for college students and the popularity among college students has not changed; estimates for Facebook use among college students (96%) are consistent with the preliminary survey findings. The most frequently identified barrier to accessing food safety information was a lack of time; and in keeping with that finding, messages and videos developed for use in the social media intervention were designed to be both focused and brief. Over ninety percent of students identified the Internet as where they would go to access food safety information, confirming that the Internet would be an appropriate medium to reach the target audience.

Involving college students in online focus groups allowed the students to better define the type of intervention that would work best for a college population. Food safety messages that students identified as being important were highlighted in videos and wall postings in the resulting intervention. Videos and YouTube were frequently identified as a preferred delivery method for food safety education, and four food safety videos were developed as a part of the intervention to educate students. Recipe demonstrations were concluded to be an effective means for the delivery of food safety education, and one video was developed as a recipe demonstration focusing on the safe handling techniques integral to the recipe. The Internet and various websites and search engines were most frequently identified by students in the focus groups as a source to obtain food safety information, and this corresponds with the data from the

preliminary survey. The Food Network was also cited as a source of food safety information, and this presents both a cause for concern and a need for additional food safety education. Content analysis of 49 Food Network episodes revealed 460 poor food handling incidents compared to 118 positive food safety measures (Irlbeck, Akers and Brashears, 2009). Food safety educators can integrate food safety messages into recipe demonstrations allowing them to attract and entertain audiences, yet teach at the same time. Using the results from the formative evaluation (preliminary surveys and online focus groups), a logic model (Appendix F) was created to guide the development of the educational program. The logic model presented a pathway from the intervention inputs and activities to the intended outcomes of the study. The framework of the intervention was based on the social learning theory as the Facebook page gave students a learning environment that promoted social interaction. The social learning theory explains behavior in terms of the interaction between cognitive, behavioral and environmental influences (Bandura, 1986). Observational learning involves the processes of attention, retention, motor reproduction, and motivation. After postings, questions were often asked to gain the attention of students and encourage communication on the food safety issues at hand; discussion was intended to promote a better understanding of safe food handling. Resulting discussions often led students to share their personal encounters with foodborne illness and prompted many students to ask additional food safety questions.

Results from preliminary analysis of pre-test scores reveal that all treatment groups and control groups in this study were similar in terms of food safety attitude, practice, and knowledge scores at the beginning of the study and prior to the intervention. Females were found to have significantly higher practice pre-test scores compared to males, and this finding is consistent with other research in the field (Unklesbay et al., 1998, Byrd-Bredbenner et al., 2007b). As expected,

individuals with food service experience had higher practice and knowledge scores, and these scores could be related to worksite training. Surprisingly, individuals who had participated in a class or club where safe food handling was taught did not have higher practice or knowledge scores. These participants did have increased attitude scores, indicating that informal food safety education has a positive effect on attitudes toward safe food handling. Living in a shared apartment or house was related to increased food safety knowledge, yet individuals living alone did not share in this improvement. This finding, in keeping with the principles of the social learning theory, may indicate that students who live and prepare food in a communal environment may learn valuable food safety information from their peers. Years living away from home had no effect on attitude, practice or knowledge score indicating that independence does not lead to improved food safety measures. Increased frequency of meal preparation had a positive effect on food safety attitudes and knowledge, but these findings also lack practical significance as increased scores were not significant at some high frequency preparation categories, specifically 7-12 times per week.

In comparing the groups in terms of attitude, all groups with the exception of the C group had significant improvements in attitude scores indicating that food safety education has a positive effect on food safety attitudes. The LF15 group had a significantly greater average improvement in attitude score than both the C and L groups indicating that the Facebook intervention combined with the lecture had a more profound impact on food safety attitudes than the lecture alone. In terms of food safety practices, all groups had significant improvement in practice scores suggesting that the participation in testing alone could have impacted food safety practices. The “Safe Eats” Facebook page had the largest impact on improvement of food safety practice scores as LF15, F and F15 groups had a significantly greater improvement of scores than

the other groups. This finding may indicate that the Facebook page provided the motivation to make behavior changes. All groups with the exception of the C group had significant improvements in their food safety knowledge scores, and this was expected as all these groups received food safety education. Groups that received the lecture (L, LF, and LF15 groups) had significantly greater improvement in scores than the other groups, indicating that the lecture had a profound impact on food safety knowledge gained. This relationship between lecture and higher knowledge scores could be an effect of their coursework, as the lecture was part of an introduction to foods and nutrition class and the students were to be formally tested on the material as a part of the course. Therefore, the necessity to perform well on the course tests could have motivated student learning. Interestingly, over 50% of students who received both the lecture and access to the Facebook page indicated that they learned more from the Facebook page compared to the lecture. A majority of students (66.8%) indicated they enjoyed the Facebook page more than their food safety lecture, and this finding is consistent with the change in attitude scores. A more enjoyable learning experience will often lead to improved attitudes about the subject area. Overall, students who self-reported they had spent 15 minutes or more per week on the Facebook page had better overall outcomes than those who spent less than 15 minutes. This conclusion is logical as students who spent more time on the page had increased exposure to discussions, videos, and other posted information. Videos were identified as the most useful of the postings presented on the Facebook page, and this finding confirms the original notion that videos were the preferred delivery method. Students in the treatment groups self-reported that their participation in the intervention had led them to make behavior changes. This is indicative that the use of social media for food safety education can lead to changes in behavior to reduce the incidence of foodborne illness. This finding is supported by food safety

research with this population, which suggests that changes in food safety knowledge and attitudes will translate into safer food handling practices (Unklesbay et al., 1998). Participants also indicated they were likely to continue using online resources for learning food safety information and were likely to share food safety information with others suggesting that the Facebook intervention has created both an interest in and advocacy for food safety. These particular changes can lead to improvements in the food safety habits of individuals outside the reach of this study. Some students (31.2%) indicated in the preliminary survey that they were unlikely to use Facebook for food safety information, but individuals (90.0%) who participated in the treatment groups indicated that they were likely to use Facebook for information on a health/safety topic. This finding indicates that using Facebook for food safety information has a positive effect on a student's future usage. Overall, results from the intervention indicate that Facebook is an effective medium for food safety education of college students, and support the hypothesis that, "food safety education offered in a social media environment will improve the knowledge, attitudes, and behaviors related to food safety in college students."

A limitation of this study could be that the study population may not be representative of the population as a whole, as participants were recruited from one type of course in one university setting. However, analyses were used to determine that participant populations across groups were homogeneous at the beginning of the study. Even though these groups did not differ from each other, they may have differed from the general population. Survey, pre-tests and post-tests designed for this study included questions taken from previously validated surveys. Additional questions were added to assess variables not covered in previous surveys. Although the adapted survey was not field tested, surveys were reviewed by a panel of experts (faculty and Extension food safety educators from four universities at various locations nationwide, the director of a

university survey research center, an evaluation specialist, and the director of a university statistical consulting center) along with two graduate-level college students to ensure content validity and usability. Data from pre-tests and post-tests were collected using the Internet, and although students were instructed to answer independently, no controls could be used to ensure that students did not receive help from outside sources. Significant improvement in practice scores were noted for the students in the C group receiving no education. Testing alone may have increased awareness of the need for changing food handling practices and served as a motivator for change in this group. All data were self-reported; therefore practice scores may not be completely reflective of actual behaviors in the kitchen. The overall findings in this study indicate that social media, specifically Facebook, is an effective educational method for reaching college students and improving their food safety knowledge, attitudes and safe food handling practices.

Table 4.0 – Description of college students participating in a food safety education study

Group	Number of Students	Gender (%) ^a		Class/Club (%) ^b		Work Experience (%) ^c	
		Male	Female	Yes	No	Yes	No
Preliminary survey group (S)	93	16.1	83.9	45.2	54.8	46.2	53.8
Online focus group (O)	38	-	-	-	-	-	-
Treatment group 1(LF)	173	11.7	88.3	39.9	60.1	39.9	60.1
Treatment group 1 (LF15)	101	19.8	80.2	43.6	56.4	40.6	59.4
Control group 1 (L)	75	12.2	87.8	45.3	54.7	53.3	46.7
Treatment group 2 (F)	190	17.6	82.4	51.1	48.9	33.3	66.7
Treatment group 2 (F15)	88	27.3	72.7	51.1	48.9	36.8	63.2
Control group 2 (C)	83	24.1	75.9	42.2	57.8	44.6	55.4

^aGender is missing for 5 individuals.

^bHas the student belonged to a class or club that taught food safe practices, data is missing for 2 individuals.

^cHas the student worked in a restaurant or food service setting, data is missing for 2 individuals.

Table 4.1 – Distribution of living situation by group for college students participating in a food safety education study^a

	Dorm Room (%)	Shared Apartment or House (%)	Apartment or House Alone (%)	Parent's Residence (%)
Preliminary survey group (S)	24.7	66.7	3.2	4.3
Treatment group 1(LF)	15.9	78.8	1.8	3.5
Treatment group 1 (LF15)	12.4	82.5	3.1	2.1
Control group 1 (L)	21.3	66.7	5.3	6.7
Treatment group 2 (F)	30.2	66.1	0.5	3.2
Treatment group 2 (F15)	20.5	69.3	6.8	3.4
Control group 2 (C)	34.9	59.0	2.4	3.6

^aLiving situation is missing for 8 individuals.

Table 4.2 – Distribution of years lived away from home by group for college students participating in a food safety education study^a

	Less than 1 year (%)	1-2 years (%)	3 or more years (%)	Does not apply (%)
Preliminary survey group (S)	25.8	33.3	36.6	4.3
Treatment group 1(LF)	12.7	42.8	41.0	3.5
Treatment group 1 (LF15)	9.9	44.6	40.6	5.0
Control group 1 (L)	16.0	34.7	38.7	10.7
Treatment group 2 (F)	21.2	49.2	25.9	3.7
Treatment group 2 (F15)	15.9	46.6	31.8	5.7
Control group 2 (C)	21.2	35.2	42.2	3.6

^aYears lived away from home is missing for 1 individual.

Table 4.3 – Distribution of frequency of meal preparation by group for college students participating in a food safety education study^a

	Never (%)	1-3X/week (%)	4-6X/week (%)	7-12X/week (%)	>12X/week (%)
Preliminary survey group (S)	14.0	30.1	32.3	17.2	6.5
Treatment group 1(LF)	13.9	33.0	26.6	13.3	13.3
Treatment group 1 (LF15)	13.9	32.7	26.7	14.9	11.9
Control group 1 (L)	14.7	42.7	16.0	13.3	13.3
Treatment group 2 (F)	17.0	42.0	15.4	15.4	10.1
Treatment group 2 (F15)	9.1	38.6	21.6	18.2	12.5
Control group 2 (C)	6.0	49.4	20.5	14.5	9.6

^aFrequency of meal preparation is missing for 2 individuals.

Table 4.4 – Summary of preliminary survey attitude variables for college students participating in a food safety education study

Attitude Variables	Strongly Disagree (%)	Disagree (%)	Neutral/ Not Sure (%)	Agree (%)	Strongly Agree (%)
I believe my decisions and actions impact my risk for foodborne illness.	2.2	3.2	15.1	51.6	26.0
Food safety is an important issue to me.	0.0	2.2	8.6	55.9	33.3
I want to gain additional knowledge about food safety.	0.0	6.5	18.3	51.6	23.7
I believe that foodborne illnesses are common.	0.0	8.6	35.5	45.2	9.7
People are at greater risk of foodborne illness when they eat at restaurants than when they eat at home.	1.1	23.7	36.6	34.4	4.3
It's the government's responsibility to ensure that the food is safe to eat.	0.0	12.9	22.6	45.2	18.3
I have some responsibility for making sure the foods I eat are safe.	0.0	2.2	3.2	53.8	39.8

Table 4.5 – Summary of how often college students follow safe food handling practices as identified on a preliminary survey

Practice Variables	Never (%)	Seldom (%)	Sometimes (%)	Usually (%)	Always (%)
I discard food that has passed the expiration date.	1.1	0.0	8.6	30.1	60.2
I refrigerate leftovers within two hours of cooking.	0.0	1.1	14.0	30.1	54.8
I rinse fruits and vegetables with cool, running water prior to eating them.	0.0	1.1	15.1	22.6	61.3
I heat solid leftover foods, such as chicken, to 165°F before serving them.	2.2	5.4	23.7	29.0	35.5
I check the temperatures of my refrigerator/freezer with thermometers.	46.2	32.3	9.7	3.2	6.5
I heat frozen foods in the microwave according to the manufacturer's instructions.	1.1	2.2	5.4	16.1	72.0
I follow the recommended stand times for frozen foods heated in the microwave oven.	2.2	14.0	11.8	28.0	41.9
I marinate foods in the refrigerator.	5.4	14.0	18.3	21.5	29.0
I refrigerate cold foods as soon as I get home from the grocery store.	0.0	0.0	1.1	15.1	80.6
I cook eggs until they are firm and no liquid egg is visible.	2.2	5.4	14.0	26.9	43.0
While grocery shopping, I keep raw meats away from other items.	4.3	12.9	17.2	33.3	23.7
I wash my hands with warm water and soap for at least 20 seconds before handling foods.	0.0	6.5	11.8	30.1	50.5

Table 4.6 – Comparison of attitude scores on pre-tests and post-tests among groups of college students participating in a food safety education study^a

Groups	Pre-test	Post-test	P-Value ^b	Difference ^c
Treatment group 1(LF)	4.03	4.41	<0.0001	0.3817bc
Treatment group 1 (LF15)	4.13	4.56	<0.0001	0.4282c
Control group 1 (L)	4.06	4.23	0.0191	0.1646ab
Treatment group 2 (F)	4.05	4.37	<0.0001	0.3206bc
Treatment group 2 (F15)	4.16	4.57	<0.0001	0.4065bc
Control group 2 (C)	4.07	4.15	0.2899	0.0774a

^aAttitude scores are the average response to four questions related to student's attitude toward food safety. Each question is on a scale from one to five (1 = strongly disagree, 5 = strongly agree, 5 always being the most food safety conscious choice).

^bP-Value represents the significance of paired t-tests comparing pre-test to post-test scores, and values were considered significant at a p-value less than 0.05.

^c Tukey's pairwise comparison tests were used to detect where the differences were located among groups. Mean difference followed by the same letter in a column are not significantly different according to ANOVA and Tukey's HSD.

Table 4.7 – Comparison of practice scores on pre-tests and post-tests among groups of college students participating in a food safety education study^a

Groups	Pre-test	Post-test	P-Value ^b	Difference ^c
Treatment group 1(LF)	3.92	4.22	<0.0001	0.3382abc
Treatment group 1 (LF15)	3.90	4.30	<0.0001	0.5023d
Control group 1 (L)	3.98	4.08	<0.0001	0.1747a
Treatment group 2 (F)	3.85	4.26	<0.0001	0.3708cd
Treatment group 2 (F15)	3.93	4.40	<0.0001	0.3659bcd
Control group 2 (C)	3.91	4.17	<0.0001	0.1846ab

^aPractice scores are the average response to 12 questions related to how students act on their understanding of safe food practices. Each question is on a scale from 1 to 5 (1 = never, 5 = always, 5 being the most food safety conscious choice).

^bP-Value represents the significance of paired t-tests comparing pre-test to post-test scores, and values were considered significant at a p-value less than 0.05.

^cTukey's pairwise comparison tests were used to detect where the differences were located among groups. Mean difference followed by the same letter in a column are not significantly different according to ANOVA and Tukey's HSD.

Table 4.8 – Comparison of knowledge scores on pre-tests and post-tests among groups of college students participating in a food safety education study^a

Groups	Pre-test	Post-test	P-Value ^b	Difference ^c
Treatment group 1(LF)	0.7595	0.8562	<0.0001	0.08973b
Treatment group 1 (LF15)	0.7833	0.8752	<0.0001	0.08602b
Control group 1 (L)	0.7622	0.8514	<0.0001	0.08216b
Treatment group 2 (F)	0.7771	0.8048	<0.0001	0.02039a
Treatment group 2 (F15)	0.7753	0.8042	0.0103	0.02444a
Control group 2 (C)	0.7508	0.7676	0.0600	0.01179a

^aKnowledge scores were calculated as a percentage of correct and incorrect answers based on a 35 point test. For analysis, the percentage scores were recorded on a scale of 0.00 to 1.00.

^bP-Value represents the significance of paired t-tests comparing pre-test to post-test scores, and values were considered significant at a p-value less than 0.05.

^cTukey's pairwise comparison tests were used to detect where the differences were located among groups. Mean difference followed by the same letter in a column are not significantly different according to ANOVA and Tukey's HSD.

Table 4.9 – Reflective views of college students in treatment group 1^a about the “Safe Eats” Facebook intervention

	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)
I enjoyed learning about food safety in a social media-based format	36.9	52.6	8.0	1.5	0.4
I am more interested in food safety topics now than before using the Safe Eats Facebook page	33.6	46.4	16.8	2.6	0.0
I learned more from the Safe Eats Facebook page than from the food safety lecture	15.3	35.8	34.3	13.1	0.7
I enjoyed the learning experience using the Safe Eats Facebook page more than the food safety lecture	23.4	43.4	26.3	5.1	0.4

^aTreatment group 1 had both an in-class food safety lecture and access to the “Safe Eats” Facebook page.

Table 4.10 – Reflective views of college students in treatment group 2^a about the “Safe Eats” Facebook intervention

	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)
I enjoyed learning about food safety in a social media-based format	33.8	55.8	9.0	1.1	0.4
I am more interested in food safety topics now than before using the Safe Eats Facebook page	30.9	51.1	13.3	1.4	1.4

^aTreatment group 2 had exposure to the “Safe Eats” Facebook page only with no food safety lecture.

Table 4.11 – Likelihood of college students who participated in a social media food safety intervention to continue learning and sharing food safety information^a

	Very Likely	Likely	Somewhat Likely	Unlikely	Very Unlikely
How likely are you to use Facebook to learn more about a health/safety topic in the future?	18.2, 15.5	32.5, 37.1	36.5, 37.4	9.9, 7.9	2.6, 1.8
How likely are you to use the online resources given for food safety? ^b	21.9, 24.5	40.5, 42.1	30.3, 27.3	5.8, 5.0	1.1, 1.1
How likely are you to share food safety information with others?	40.9, 31.7	39.4, 41.4	15.3, 21.9	2.2, 4.0	0.4, 0.0

^aTreatment group 1 data followed by treatment group 2 data in each cell.

^bOnline resources given consisted of websites (www.fightbac.org, www.holidayfoodsafety.org, www.foodsafety.gov, and www.recalls.gov).

Figure 4.0 – Use of social media as identified by college students on a preliminary survey

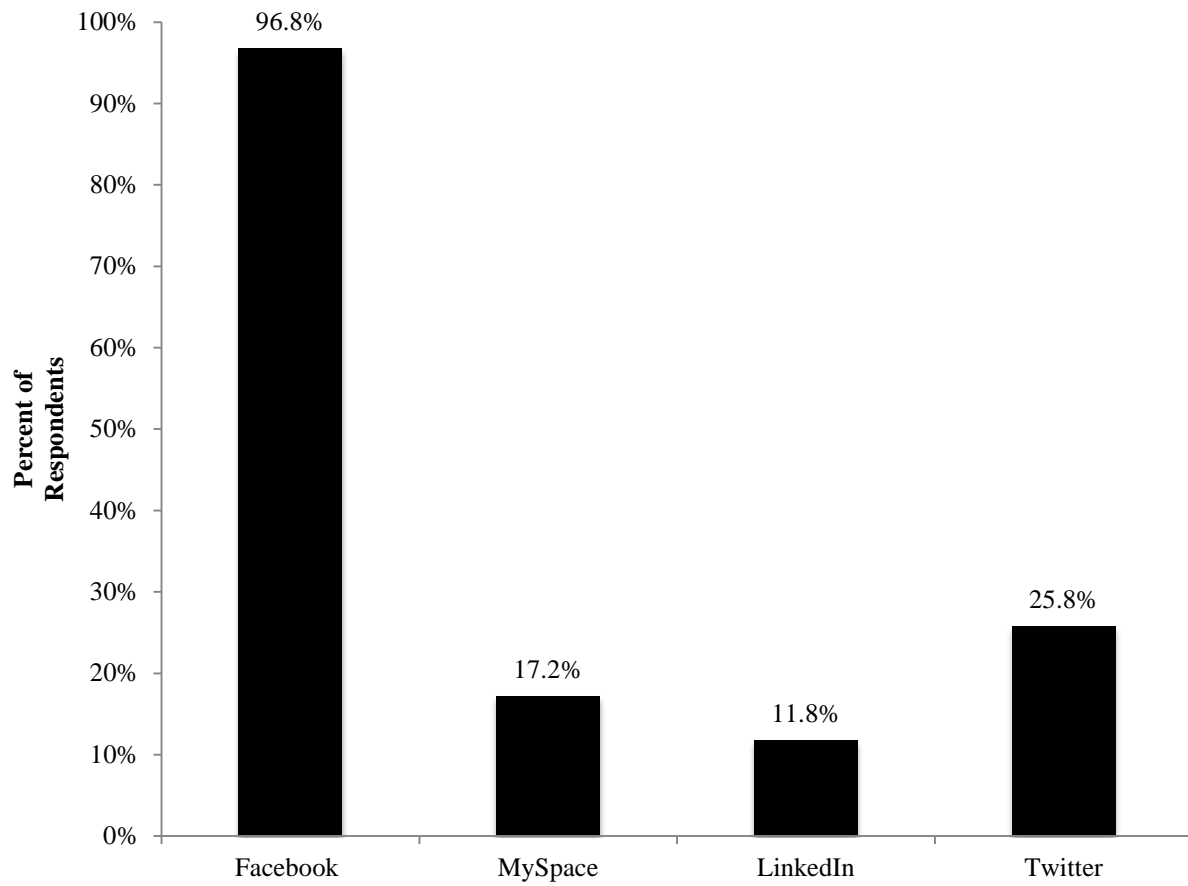


Figure 4.1 – Likelihood of college students to use social media to learn food safety information as identified on a preliminary survey

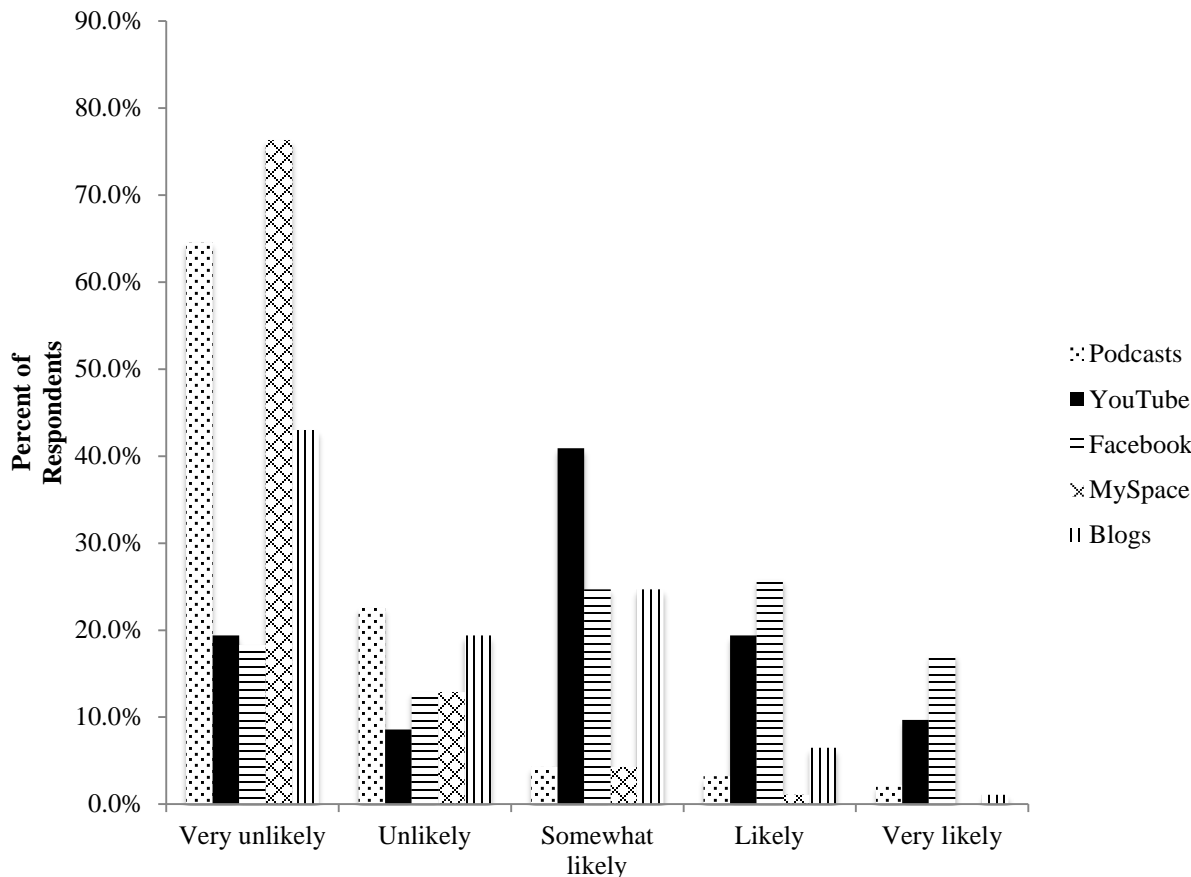


Figure 4.2 – Barriers to using social media to obtain food safety information as identified by college students on a preliminary survey

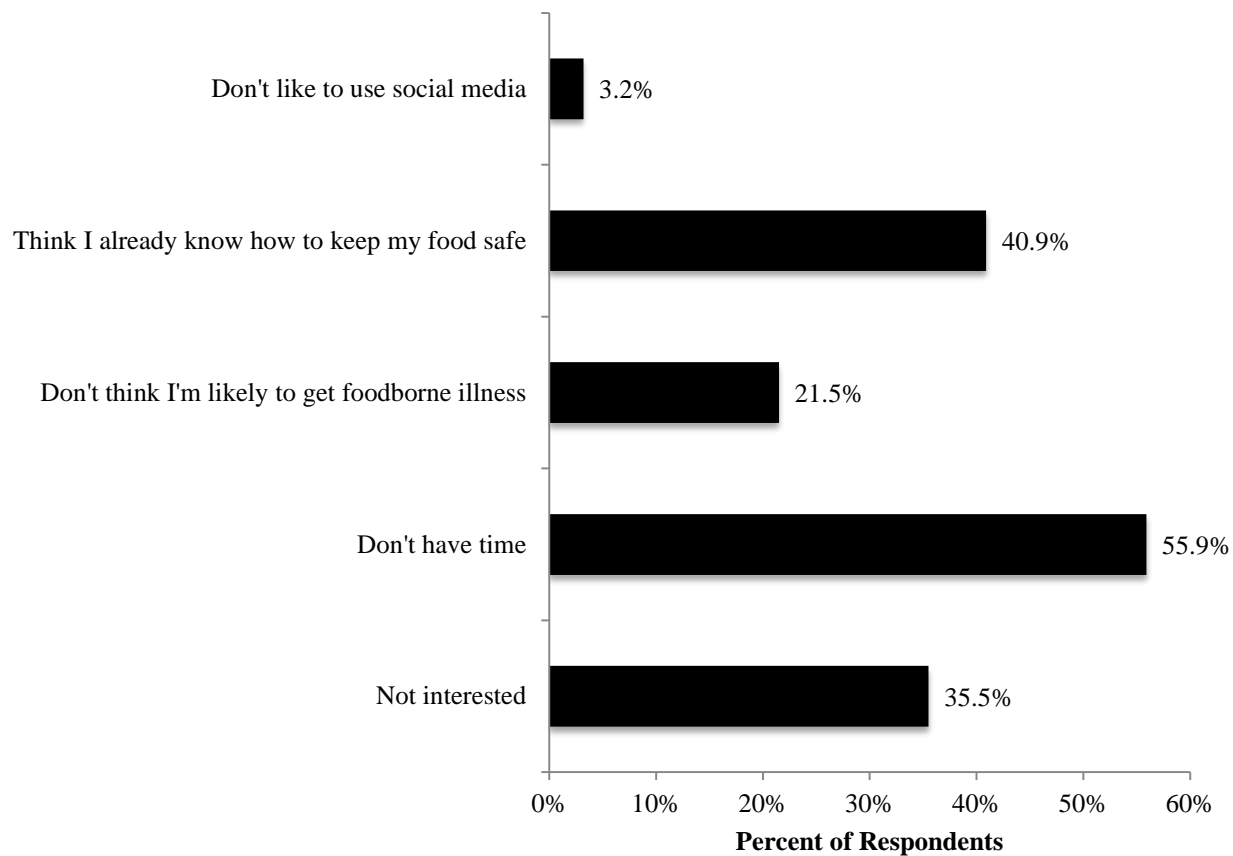


Figure 4.3 – Sources college students would use to obtain food safety information as identified on a preliminary survey

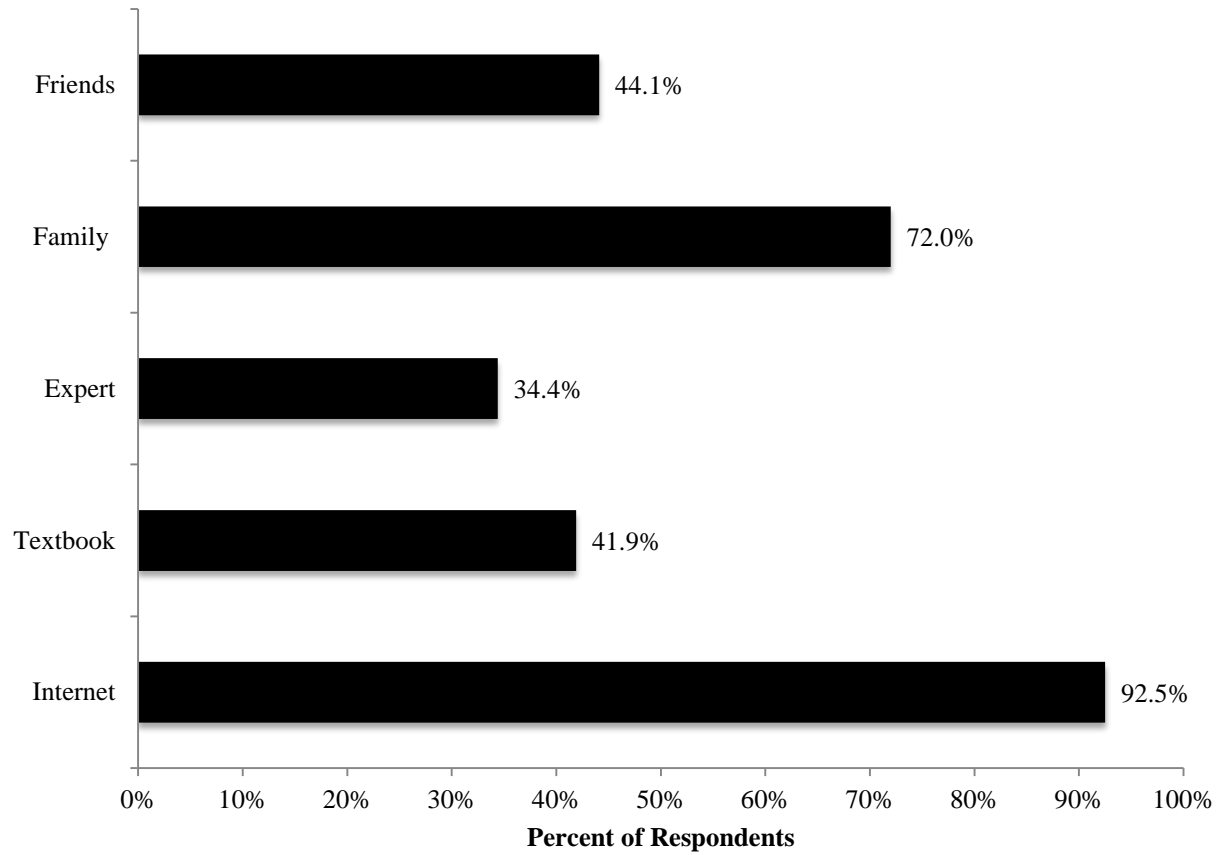


Figure 4.4 – Food safety messages identified by college students as being important

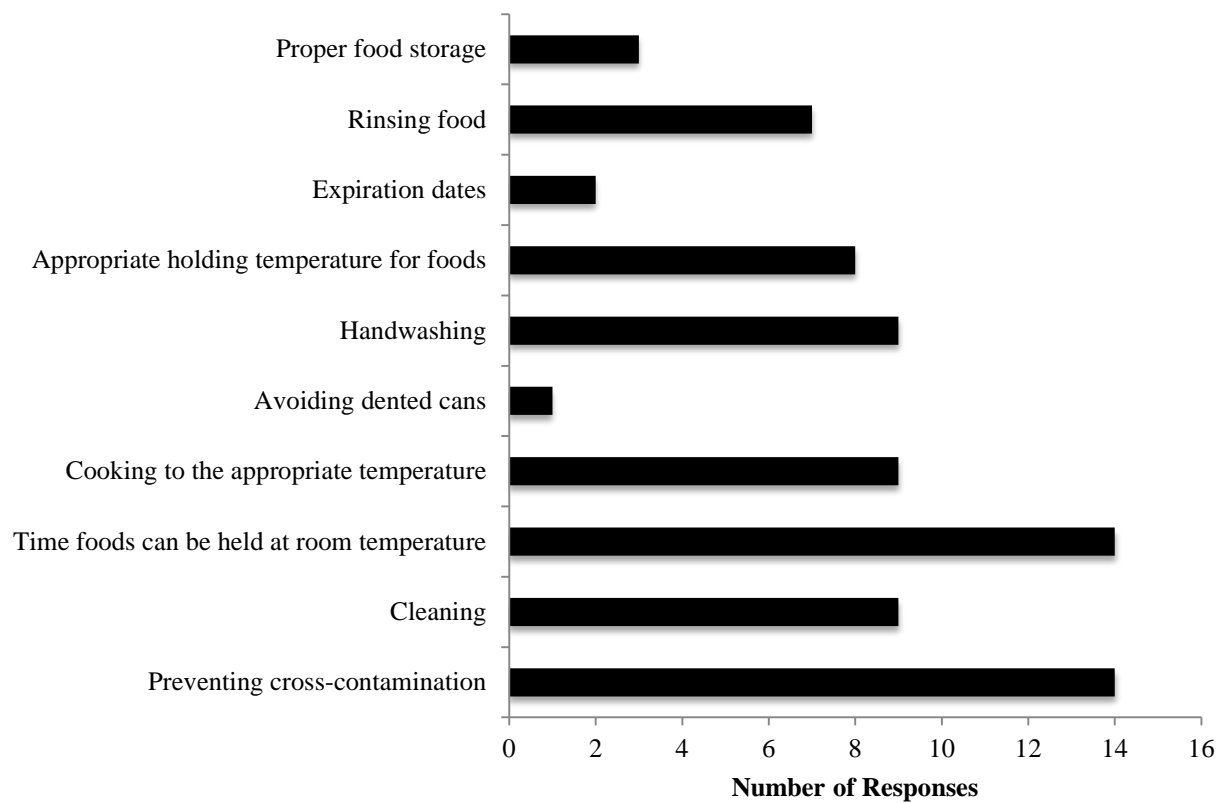


Figure 4.5 – Methods of delivery identified by college students as preferred for obtaining food safety education

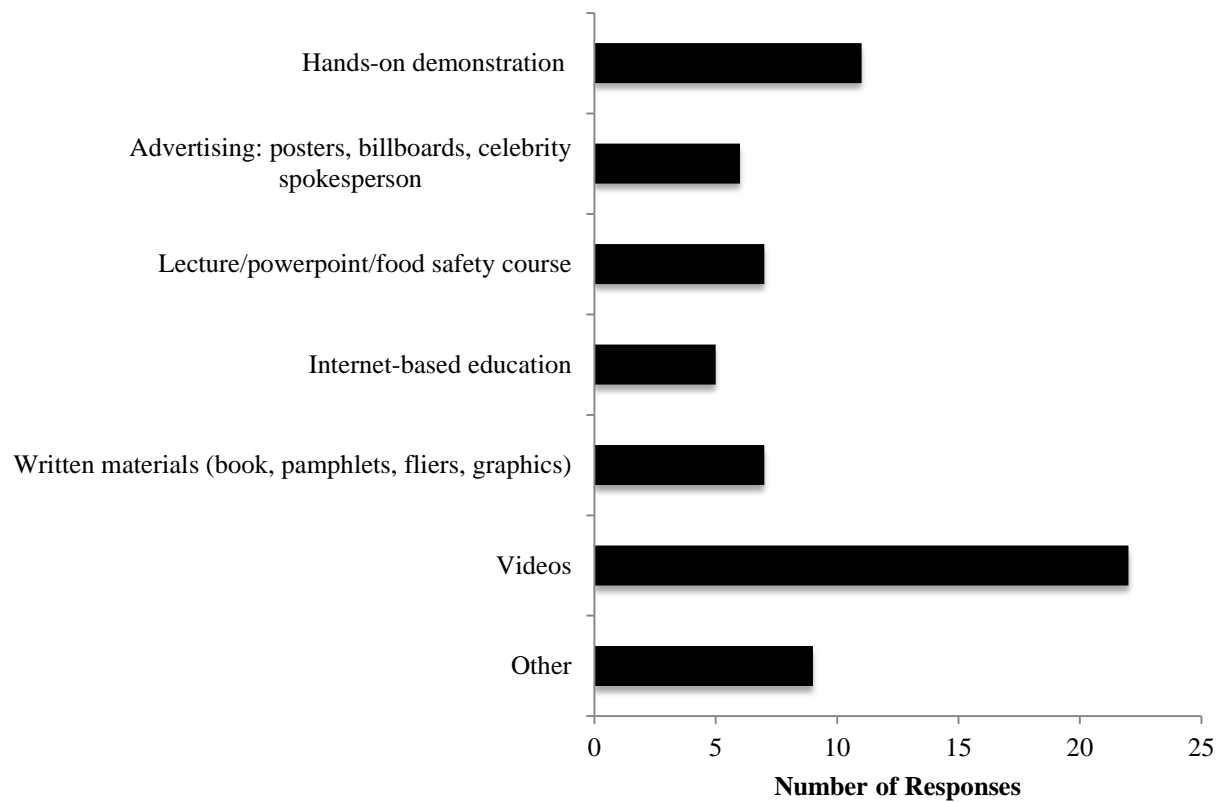


Figure 4.6 – Effective tools for presenting food safety information via social media as identified by college students

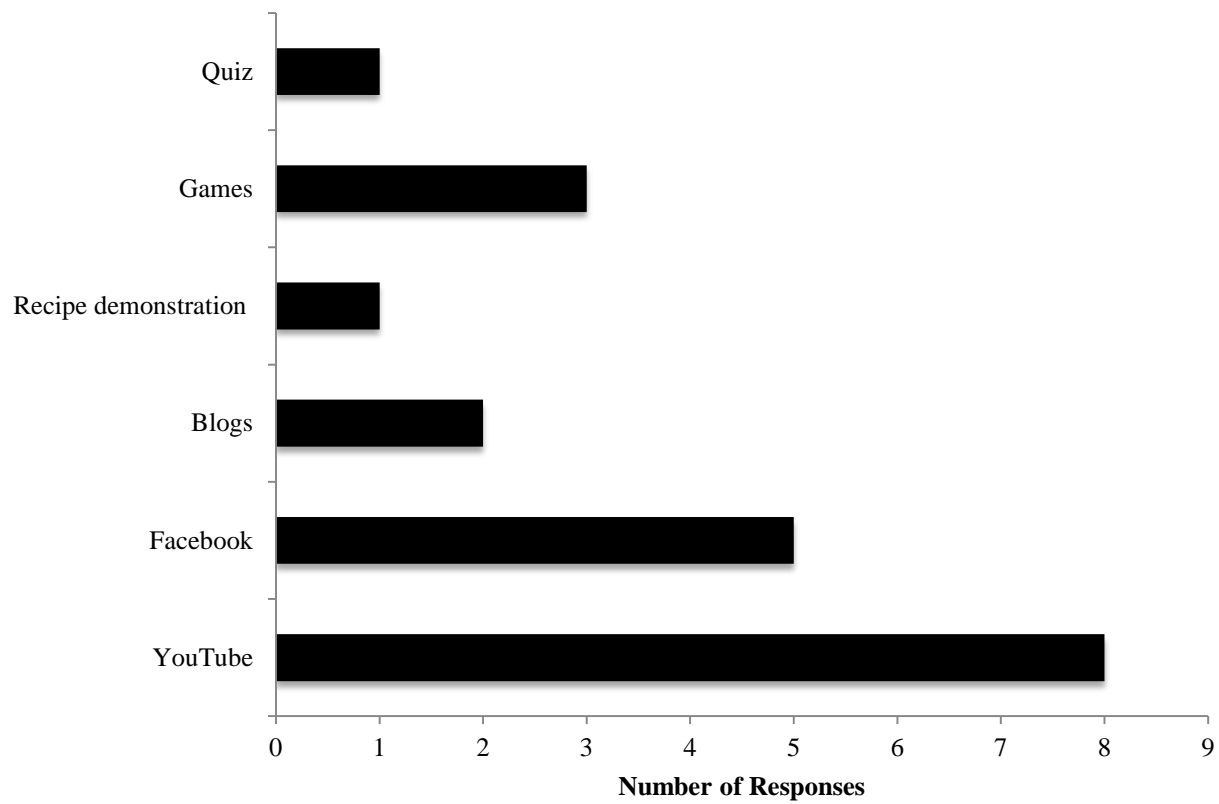


Figure 4.7 – Preferred methods for food safety education using a Facebook fan page as identified by college students

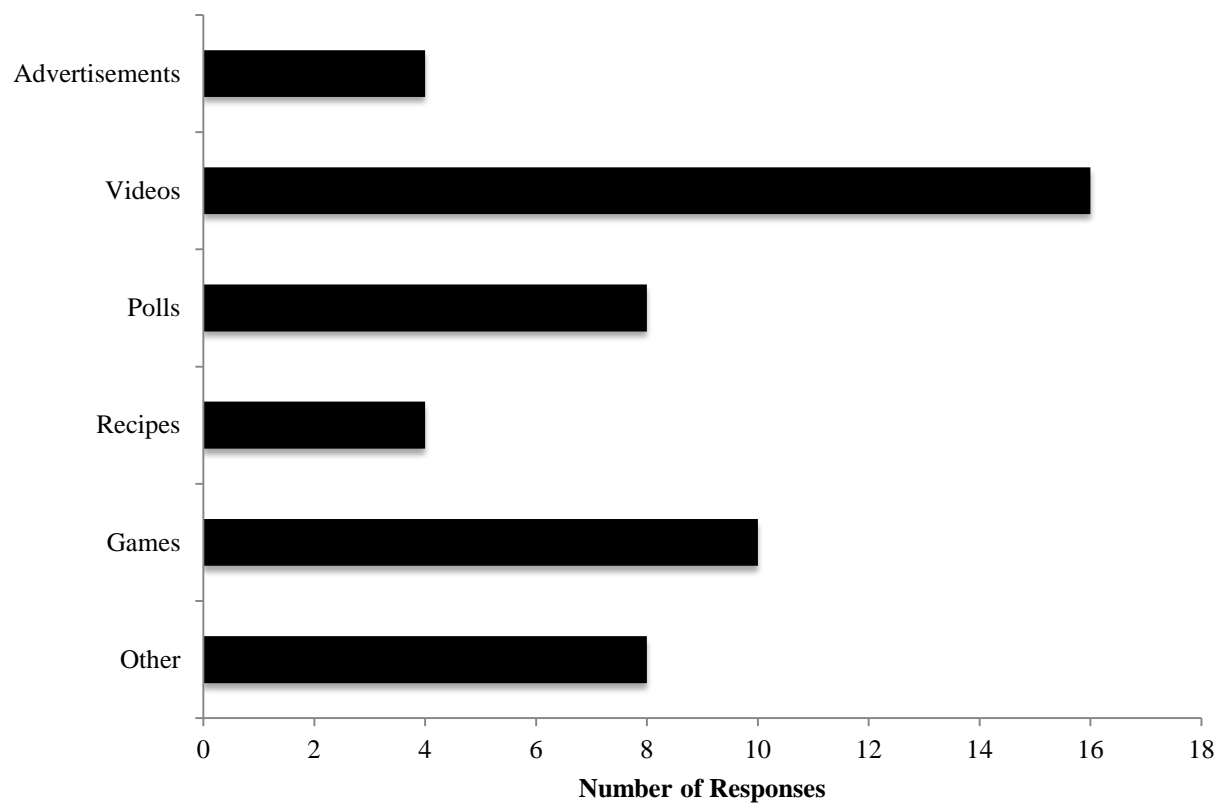


Figure 4.8 – Sources college students would use to obtain food safety information as identified in an online focus group

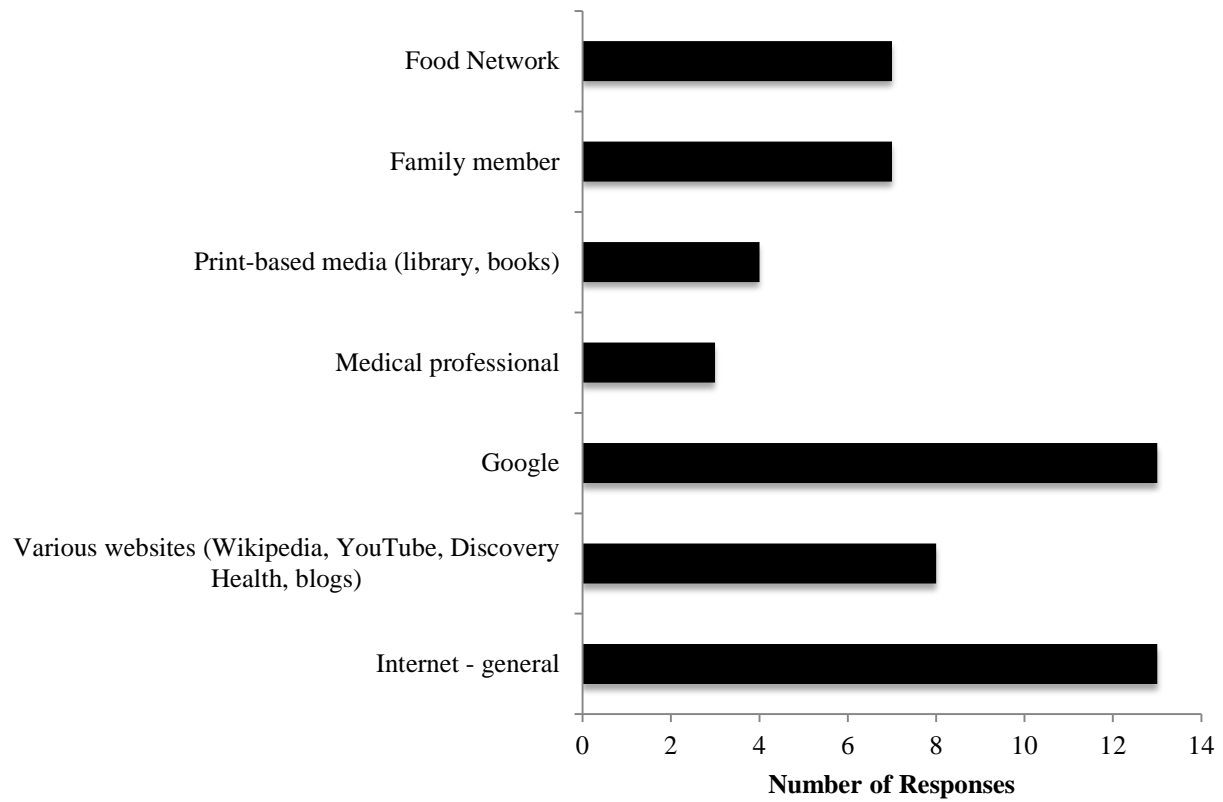


Figure 4.9 – Time spent on the “Safe Eats” Facebook page by college students in various treatment groups

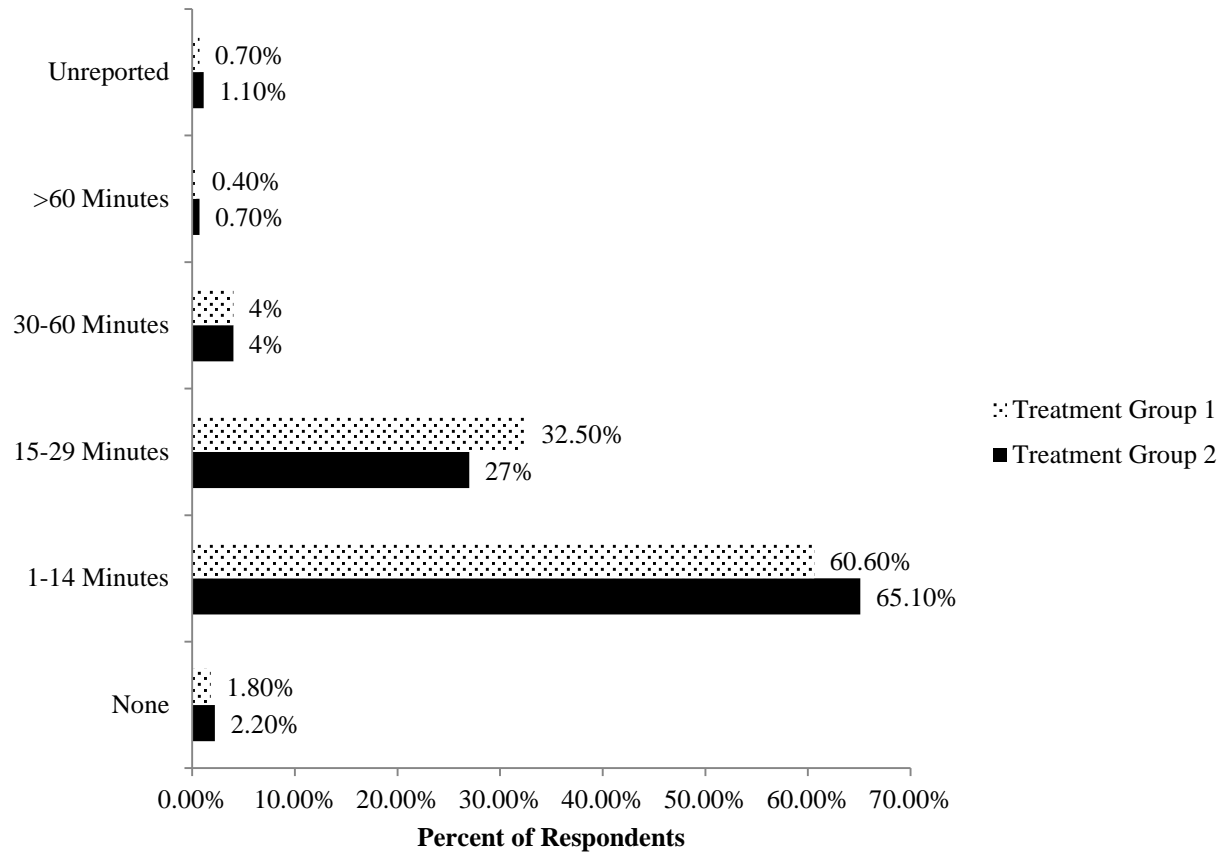


Figure 4.10 – College students' ranking of usefulness of Facebook postings for food safety education

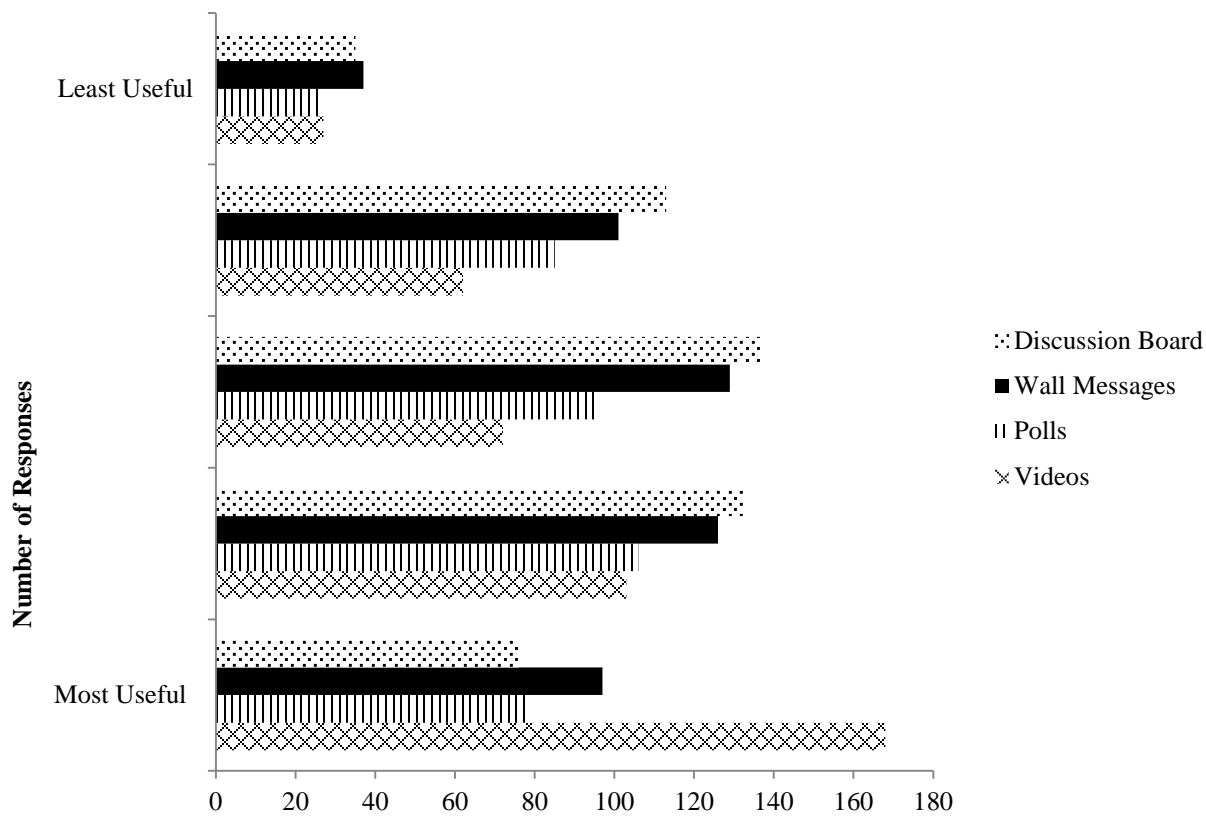
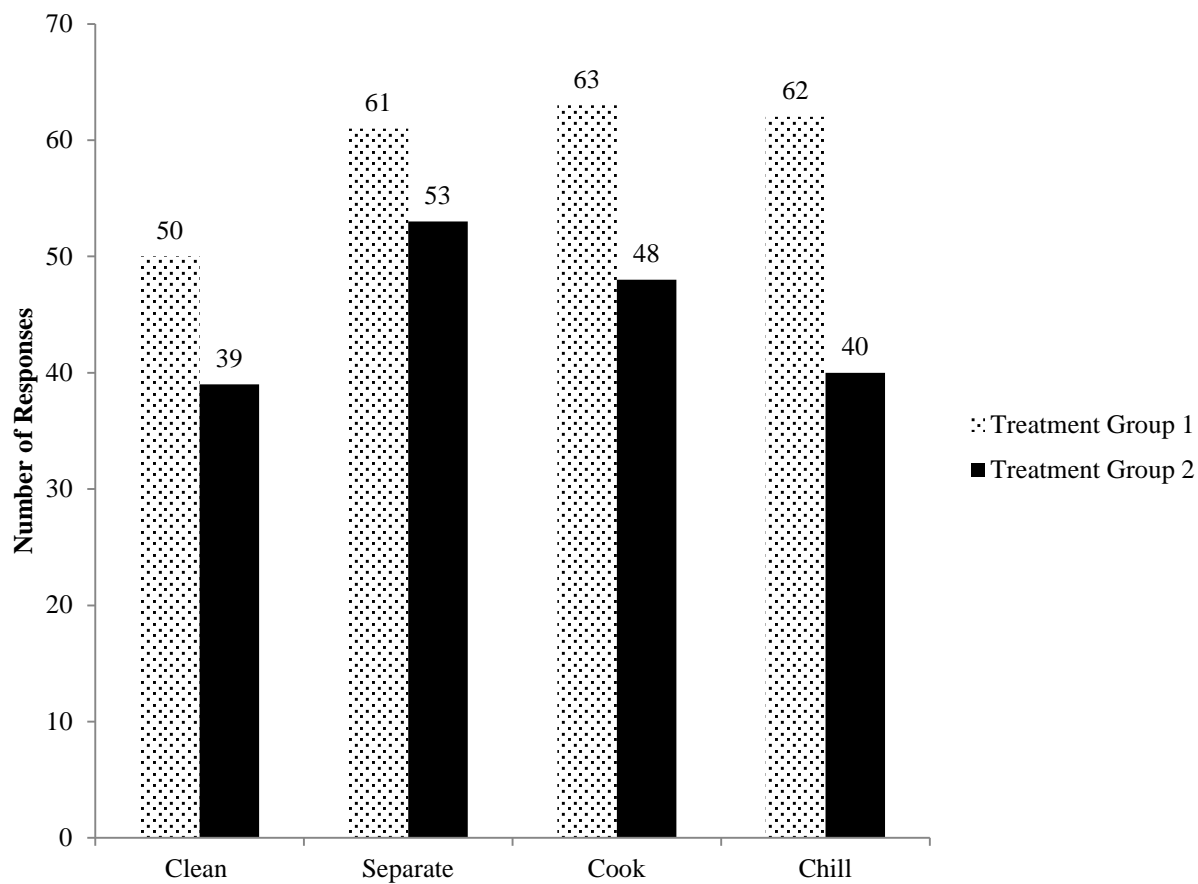


Figure 4.11 – Frequency of commonly identified food safety behaviors as indicated by college students who intend to make changes in food handling practices



CHAPTER 5

SUMMARY AND CONCLUSIONS

Rates of foodborne illness in this country can be impacted by improved food handling practices of individuals. Food safety educators are employing social media to convey safe food handling messages, yet the true impact of these techniques is unknown. Results of this study indicate that social media is an acceptable alternative to traditional food safety education.

Although traditional food safety lectures may be a more useful means of increasing food safety knowledge, food safety educators may inspire notable changes in food safety attitudes, practices, and knowledge through the innovative use of social media. Communication via Facebook and other social media applications should be open, and greater discussion is likely related to better outcomes. Tailored messages were better received by the target audience, and the target audience appeared to be receptive to the intervention as a whole. Facebook affords food safety educators an attractive means to communicate food safety messages, and is an appropriate and effective method for food safety education for young adults. Facebook may not be an appropriate means to reach all audiences, and although individuals of all ages may have a Facebook profile, this method may not have success at reaching older audiences.

Future research should explore the relationship between informal communications on social media sites with food safety outcomes. Studies should attempt to reach a more diverse audience to understand the efficacy of social media across populations as many current efforts using social media attempt to reach a variety of individuals.

REFERENCES

- Baird, D.E. and M. Fisher. 2005. Neomillennial user experience design strategies: utilizing social networking media to support “always on” learning styles. *J. Edu. Tech Syst.* 34:5-32.
- Bandura, A. 1986. *Social foundations of thought and action: a social cognitive theory.* Prentice Hall, Englewood Cliffs, NJ.
- Beffa-Negrini, P. A., N. L. Cohen, M. J. Laus, and L. A. McLandsborough. 2007. Development and evaluation of an online, inquiry-based food safety education program for secondary teachers and their students. *J. Food Sci. Edu.* 6:66-71.
- Bennett, G. C. and R. E. Glasgow. 2009. The delivery of public health interventions via the internet: actualizing their potential. *Annu. Rev. Public Health.* 30:273-292.
- Burke, S. C. and S. L. Snyder. 2008. YouTube: an innovative learning resource for college health education courses. *Int. Elect. J. Health Edu.* 11:39-46.
- Byrd-Bredbenner, C., J. M. Abbot, V. Wheatley, D. Schaffner, C. Bruhn, and L. Blalock. 2008. Risky eating behaviors of young adults--Implications for food safety education. *J. Amer. Diet. Assoc.* 108:549-552.
- Byrd-Bredbenner, C., J. Maurer, V. Wheatley, E. Cottone, and M. Clancy. 2007a. Food safety hazards lurk in the kitchens of young adults. *J. Food Pro.* 70:991-996.
- Byrd-Bredbenner, C., J. Maurer, V. Wheatley, D. Schaffner, C. Bruhn, and L. Blalock. 2007b. Food safety self-reported behaviors and cognitions of young adults: Results of a national study. *J. Food Pro.* 70: 1917-1926.

Byrd-Bredbenner, C., V. Wheatley, D. Schaffner, C. Bruhn, L. Blalock, and J. Maurer. 2007c. Development and implementation of a food safety knowledge instrument. *J. Food Sci. Edu.* 6:46-55.

Cassell, M. M., C. Jackson, and B. Cheuvront. 1998. Health communication on the internet: an effective channel for health behavior change? *J. Health Comm.* 3:71-79.

Centers for Disease Control and Prevention. 2011a. Norovirus. Available at:

<http://www.cdc.gov/ncidod/dvrd/revb/gastro/norovirus.htm>. Accessed 17 March 2011.

Centers for Disease Control and Prevention. 2011b. Social media guidelines and best practices. Available at: <http://www.cdc.gov/SocialMedia/Tools/guidelines/index.html>. Accessed 8 April 2011.

Chou, W. S., Y. M. Hunt, E. B. Beckjord, R. P. Moser, and B. W. Hesse. 2009. Social media use in the United States: Implications for health communication. *J. Med. Internet Res.* 11:e48.

Fein S.B., C. T. Jordan Lin, and A. S. Levy. 1995. Foodborne illness: perceptions, experience, and preventive behaviors in the United States. *J Food Pro.* 58:1405-1411.

Fox F. E., M. Morris, and N. Rumsey. 2007. Doing synchronous online focus groups with young people: methodological reflections. *Qual. Health Res.* 17:539-547.

Galson, S. K. 2009. To eat or not to eat? Food safety in the United States. *J. Amer. Diet. Assoc.* 109:1142.

Goldman, K. D. and K. J. Schmalz. 2006. Logic models: the picture worth ten thousand words. *Health Promot Pract.* 7:8-12.

Israel, G. D. 2001. Using logic models for program development. Available at:

<http://edis.ifas.ufl.edu/pdffiles/WC/WC04100.pdf>. Accessed 31 March 2011.

- Irlbeck, E. G., C. Akers, and M. M. Brashears. 2009. A content analysis of food safety measures on television's Food Network. *Food Prot. Trends.* 29:16-20.
- Jacob, C., L. Mathiasen, and D. Powell. 2010. Designing effective messages for microbial food safety hazards. *Food Ctrl.* 21:1-6.
- Joinson, A. N. 2008. Proceedings from CHI 2008: 'Looking at', 'looking up' or 'keeping up with' people? Motives and uses of Facebook. Florence, Italy.
- Kaptan G. and B. Fischhoff. 2011. Diagnosing food-borne illness: A behavioral analysis of barriers to testing. *J. Public Policy.* 32:60-72.
- Lindsay, J. A. 1997. Chronic sequelae of foodborne disease. *Emerg. Infect. Dis.* 3:443-452.
- Lenhart, A., K. Purcell, A. Smith, and K. Zickuhr. 2010. Social media and mobile use among teens and young adults. Available at: <http://pewinternet.org/Reports/2010/Social-Media-and-Young-Adults.aspx>. Accessed 7 April 2011.
- McArthur L. H., D. Holbert, and W. A. Forsythe. 2007. College students and awareness of food safety. *J Fam. Cons. Sci.* 99:60-67.
- McCarthy, M., M. Brennan, A. L. Kelly, C. Ritson, M. de Boer, and N. Thompson. 2007. Who is at risk and what do they know? Segmenting a population on their food safety knowledge. *Food Qual. Pref.* 18:205-217.
- Medeiros, L.C., V. N. Hillers, G. Chen, V. Bergmann, P. Kendall, and M. Schroeder. 2004. Design and development of food safety knowledge and attitude scales for consumer food safety education. *J. Amer. Diet. Assoc.* 104:1671-1677.
- Morris, D. and T. Penhollow. 2005. Impact of a knowledge-based food-borne illness program on food safety practices among college students. *Res.Q. Exercise Sport.* 76:A42.

- Morrone, M. and A. Rathbun. 2003. Health education and food safety behavior in the university setting. *J. Environ. Health.* 65:9-15.
- Park A., S. Nitzke, K. Kritsch, K. Kattelman, A. White, L. Boeckner, B. Lohse, S. Hoerr, G. Greene, and Z. Zhang. 2008. Internet-based interventions have potential to affect short-term mediators and indicators of dietary behavior of young adults. *J. Nutr. Educ. Behav.* 40:288-297.
- Pintauro S.J., A. G. Krahl, P. R. Buzzell, and V. M. Chamberlain. 2005. Food safety and regulation: evaluation of an online multimedia course. *J. Food Sci. Edu.* 4:66-69.
- President's Food Safety Working Group. 2009. Available at:
<http://www.foodsafetyworkinggroup.gov/Home.htm>. Accessed 10 February 2010.
- Purcell, K. 2010. The state of online video. Available at:
<http://www.pewinternet.org/Reports/2010/State-of-Online-Video.aspx>. Accessed 7 April 2011.
- Redmond E. C., and C. J. Griffith. 2004. Consumer perceptions of food safety risk, control and responsibility. *Appetite.* 43:309-313.
- Scallan, E., P. M. Griffin, F. J. Angulo, R. V. Tauxe, and R. M. Hoekstra. 2011. Foodborne illness acquired in the United States—major pathogens. *Emerg. Infect. Dis.* 17:16-22.
- Scharff, R. 2010. Health-related costs from foodborne illness in the United States. Available at:
http://www.pewtrusts.org/our_work_detail.aspx?id=582. Accessed 20 April 2010.
- Selwyn, N. 2009. Proceedings from OECD/CERI Expert meeting: Web 2.0 and the school of the future, today. Santa Catarina, Brazil.
- Stein, S. E., B. P. Dirks, and J. J. Quinlan. 2010. Assessing and addressing safe food handling knowledge, attitudes, and behaviors of college undergraduates. *J. Food Sci. Edu.* 9:47-52.

Strolla, L. O., K. M. Gans, and P. M. Risica. 2006. Using qualitative and quantitative formative research to develop tailored nutrition intervention materials for a diverse low-income audience.

Health Edu. Res. 21:465-476.

The Partnership for Food Safety Education. 2010. Safe food handling. Available at:

<http://www.fightbac.org/safe-food-handling>. Accessed 12 April 2011.

Unklesbay, N., J. Sneed, and R. Toma. 1998. College students' attitudes, practices, and knowledge of food safety. *J Food Pro.* 61:1175-1180.

U.S. Department of Agriculture Food Safety and Inspection Service. 2008. Kitchen Companion.

Available at: http://www.fsis.usda.gov/Fact_Sheets/Kitchen_Companion/index.asp. Accessed 1 September 2010.

U.S. Department of Agriculture Food Safety and Inspection Service. 2010. Be food safe.

Available at: http://www.fsis.usda.gov/be_foodsafe/. Accessed 12 April 2011.

U.S. Department of Health and Human Services. 2010. Food Safety. Available at:

<http://healthypeople.gov/2020/topicsobjectives2020/objectiveslist.aspx?topicid=14>. Accessed 17 March 2011.

Wantland D. J., C. J. Portillo, W. L. Holzemer, R. Slaughter, and E. M. McGhee. 2004. The effectiveness of web-based vs. non-web-based interventions: a meta-analysis of behavioral change outcomes. *J. Med. Internet Res.* 6:e40.

Yarrow, L., V. M. Remig, and M. M. Higgins. 2009. Food safety educational intervention positively influences college students' food safety attitudes, beliefs, knowledge, and self-reported practices. *J. Environ. Health.* 71:30-35.

Woo Y. and T. C. Reeves. 2007. Meaningful interaction in web-based learning: a social constructivist interpretation. *Internet High Educ.* 10:15-25.

APPENDIX A

PRELIMINARY SURVEY GROUP

Survey and consent letter

Food Safety Education for College Students

1. Informed Consent

Dear potential participant:

I am a graduate student in the Department of Foods and Nutrition at The University of Georgia. I invite you to participate in a research study entitled Online Food Safety Education that is being conducted under the auspices of Dr. Judy Harrison. The purpose of this study is to investigate college students' attitudes, habits, and knowledge related to food safety, as well as their preferred methods of learning and participation in social media websites.

Your participation will involve completing an online survey and should only take about ten minutes. Your involvement in the study is voluntary, and you may choose not to participate or to stop at any time without penalty or loss of benefits to which you are otherwise entitled. In order to participate in this survey, you must be 18 years or older. Participation in this study will remain completely confidential and no identifiers will be used. Researchers will make every effort to ensure confidentiality; however, there is a limit to the confidentiality that can be guaranteed due to the technology itself. The results of the research study may be published, but your identity will not be associated with your responses in any published format.

The findings from this project may provide information on the food safety knowledge, attitudes and behaviors of college students and an appropriate medium for food safety education. There are no known risks or discomforts associated with this research.

If you have any questions about this research project, please feel free to contact me through the secretary at 706-542-3773 or send an e-mail to abram87@uga.edu. Questions or concerns about your rights as a research participant should be directed to The Chairperson, University of Georgia Institutional Review Board, 612 Boyd GSRC, Athens, Georgia 30602-7411; telephone (706) 542-3199; email address irb@uga.edu.

By clicking next and completing this questionnaire, you are agreeing to participate in the above described research project.

Thank you for your time and consideration!

Sincerely,

Ashley Bramlett

Food Safety Education for College Students

2. Attitudes toward Food Safety

Rate each of the statements below:

	Strongly Disagree	Disagree	Neutral/Not Sure	Agree	Strongly Agree
I believe my decisions and actions impact my risk for foodborne illness.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Food safety is an important issue to me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I want to gain additional knowledge about food safety.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe that foodborne illnesses are common.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People are at greater risk of foodborne illness when they eat at restaurants than when they eat at home.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is the government's responsibility to ensure that food is safe to eat.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have some responsibility for making sure the foods I eat are safe.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

What food safety issues concern you?

Food Safety Education for College Students

4. Food Safety Knowledge

Using your knowledge of food safety information, check all the acceptable practices in each of the following questions. Each question may have more than one acceptable practice or none at all.

It's safe to defrost raw meat:

- on the kitchen counter.
- in the refrigerator.
- in the microwave followed by immediate cooking.
- in cold water that is changed every thirty minutes.

In the refrigerator, it's safe to store raw meat:

- on the top shelf.
- on the middle shelf.
- on the bottom shelf.

It's safe to eat refrigerated leftovers:

- for three to four days.
- for five to seven days.
- for seven to ten days.

If I know I have handled a food incorrectly, it is okay for me to eat it if:

- it still smells okay.
- it still looks okay.
- it still tastes okay.

To prevent food spoilage, the refrigerator temperature should be no higher than:

- 32°F
- 45°F
- 40°F

Food Safety Education for College Students

After cooking meat, I would:

- serve the cooked meat on the same plate that I had the raw meat on.
- cut the cooked meat on the same plate that I had the raw meat on, but serve on a different plate.
- use a different plate to cut and serve the cooked meat.
- use the same plate, but wash it thoroughly between uses.

After handling raw meat, poultry, or fish, I clean my hands by:

- wiping them with a towel.
- rinsing them in cold water for at least 20 seconds.
- using hand sanitizer.
- washing them with soap and warm running water for at least 20 seconds.

I can tell if a burger is done if:

- it's browned on the outside.
- it springs back with the touch of a fork or spatula.
- the internal temperature is 160°F.
- it has been on the grill for 15 minutes.

After using a cutting board to trim raw chicken, I would:

- use a different board for vegetables or fruits.
- use the same board, but I wash it thoroughly between uses.
- wipe the cutting board with a dishcloth between uses.
- spray the board with a sanitizer to clean it between uses.

Food Safety Education for College Students

5. Please tell us a little bit about yourself

Gender:

- Male
 Female

What is your current living situation?

- I live in a dorm room.
 I live in a shared apartment or house.
 I live in an apartment or house by myself.
 I live in my parents' residence.

How long have you lived away from your parent/guardian's home?

- less than 1 year
 1-2 years
 3 or more years
 still live with parent/guardian

How often do you prepare meals for yourself?

- Never
 1-3 times per week
 4-6 times per week
 7-12 times per week
 More than 12 times per week

Do you have a nutrition, dietetics, food science, or food-related major?

- Yes
 No

Do you have any work experience in a restaurant or foodservice setting?

- Yes
 No

Food Safety Education for College Students

Have you ever been in a class or club where safe food handling practices were taught (ex. Family and Consumer Sciences, 4-H Club, etc)?

Yes

No

Food Safety Education for College Students

6. Education

We are almost done now. The next questions will help us better use the answers you have given us to design educational materials for college students.

Which of the following sites do you have a profile on? (check all that apply)

- Facebook
 MySpace
 LinkedIn
 Twitter

How likely are you to access food safety information using each of the social media tools listed?

	Very unlikely	Unlikely	Somewhat likely	Likely	Very likely
Podcasts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
You-tube videos	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Facebook	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
MySpace	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Blogs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

What would keep you from accessing food safety information using social media? (Check all that apply.)

- Not interested
 Don't have time
 Don't think I'm likely to get a foodborne illness
 Think I already know how to keep my food safe
 Don't like to use social media
 Other (please specify)

How would you find information on food safety or safe food handling practices? (check all that apply)

- Internet search engine (ex. Google)
 Textbook
 Expert in the field
 Family members
 Friends
 Other (please specify)

Class Flyer

We would like to encourage you to participate in an **online survey** focusing on **Food Safety Education**. To access the survey go to:

<http://www.surveymonkey.com/s/ugafoodsafety>

or follow the link on your HACE 2100 ELC page.

Your participation is greatly appreciated and makes our research possible.

If you have any questions, please contact Ashley Bramlett, abram87@uga.edu.

APPENDIX B
ONLINE FOCUS GROUP

Consent letter

Dear potential participant:

I am a graduate student in the Department of Foods and Nutrition at The University of Georgia. I invite you to participate in a research study entitled Online Food Safety Education that is being conducted under the auspices of Dr. Judy Harrison. The purpose of this study is to gather ideas and information about the design of a food safety education intervention using social media that would appeal to and provide food safety education for college students.

Your participation will involve taking part in an online focus group housed in your E-learning commons chat room. I will serve as the moderator for the focus group and ask questions about food safety and learning in a social media environment. The focus group will last approximately 20 minutes. For your participation, you will receive extra credit on a FDNS 2100 exam. If you do not wish to participate, extra credit can still be earned by completing an assignment on roles of different organizations in food safety education (this assignment is fully explained in the handout available on ELC). Participation in this study will remain completely confidential and identifiers (your UGA MyID) will be coded immediately in the transcripts from the focus group. Dr. Barbara Grossman will receive a list of participants, but this list will not be connected to any information collected from you during the course of the focus group. The list of personal identifiers will be destroyed after extra credit has been assigned. In order to participate, you must be 18 years or older. Students under the age of 18 may complete the alternative extra credit assignment. Researchers will make every effort to ensure confidentiality; however, there is a limit to the confidentiality that can be guaranteed due to the technology itself. Even though the investigator will emphasize to all participants that comments made during the focus group session should be kept confidential, it is possible that participants may repeat comments outside of the group at some time in the future. Your participation is voluntary; you can refuse to participate or stop taking part at any time without penalty or loss of benefits to which you are otherwise entitled. The results of the research study may be published, but your identity will not be associated with your responses in any published format.

The findings from this project will help us design a food safety education program for college students using social media. There are no known risks or discomforts associated with this research.

If you have any questions about this research project, please feel free to contact me through the secretary at 706-542-3773 or send an e-mail to abram87@uga.edu. Questions or concerns about your rights as a research participant should be directed to The Chairperson, University of Georgia Institutional Review Board, 612 Boyd GSRC, Athens, Georgia 30602-7411; telephone (706) 542-3199; email address irb@uga.edu.

By inputting your UGA MyID and a time in which you would like to participate in the online focus group, you are agreeing to participate in the above described research project.

Thank you for your time and consideration!

Class handout

Students of FDNS 2100:

Hi, My name is Ashley Bramlett and I am working toward a Master's degree in Foods and Nutrition. My research involves examining the knowledge and attitudes of college students about food safety and the prevention of foodborne illnesses, and using social media to deliver food safety education.

I would like to invite all of you to participate in a part of thesis project. I will be conducting an online focus group set up in the chat function of your ELC page. During the focus group, I will ask you for thoughts on food safety education and education in a social media environment. This focus group will allow me to better design a food safety education intervention for college students using social media.

The purpose of my thesis project as a whole is to develop meaningful food safety education for young adults and to find out if social media is an effective tool for the delivery of food safety education. The information generated will be published in my thesis and possibly in a research journal. All information obtained will be treated confidentially.

In order to participate, you must first fill out the consent form located under the assessment tab on ELC. Your UGA MyID will act as your signature in the consent form, and the use of your ID will be used only for the purposes of giving extra credit. Your ID on the chat transcripts will be immediately coded for purposes of confidentiality. Next, you will need to sign up for the time that you would like to participate in the focus group. A sign-up sheet is located on your ELC homepage and there are four times available- every night at 7 PM for four days- Sunday, July 25th- Wednesday, July 28th. Once you sign up, just come back to the chat room on the night you signed up before 7 PM. I will act as the moderator and the focus group should last approximately 20 minutes.

If you do not wish to participate in the online focus group, you can complete an alternative assignment for extra credit. You will not get extra credit for both the assignment and the focus group, but rather you must chose to do one or the other. The alternative assignment involves investigating food safety education initiatives online. You will research what different government agencies, non-profit groups, and policy advocates are doing in the world of food safety education, specifically their Internet initiatives and use of social media (youtube, facebook, twitter, etc.). To receive credit for the alternative assignment, you must submit a 1000 word synopsis of your research in to the dropbox set up on ELC.

If you have any questions or concerns, feel free to contact me at abram87@uga.edu.

I hope you will enjoy this opportunity to share your thoughts. If you choose to participate in the online focus group, please be sure to sign both the consent form and sign up for a time. Thank you very much for your help, your participation makes the research possible.

Moderator's Script

Welcome to our online focus group. Today, you will be asked questions about food safety and social media. Please stay until the conclusion of the questions. As stated in the consent form, your answers will remain confidential and will be separated from your personal identifier (UGA MyID) at the conclusion of this interview. As noted in the message I sent you earlier, do not navigate away from the ELC chat page or you will automatically exit from the chat room.

Let's get started. Thinking back to anything you learned in your recent food safety lecture or anything you have heard about food safety in the news, what do you think are some safe food handling practices college students or other young adults preparing their own food need to know?

We typically teach people that there are four steps to keeping food safe--- clean, separate, cook and chill. How would you deliver these messages to young people?

Let's think about the format you would use. Do you have any ideas about what you think learning in a social media environment should look like? If you've had any positive learning experiences using social media, please share these as well.

If you had a facebook fan page dedicated to food safety education, what are some things that you would do to attract people to the page? Examples might include games, polls or videos, if you have different ideas be sure to share those as well. Also on that same note, do you think facebook is an effective way to reach young adults with education?

What do you think about integrating food safety education in to a recipe demonstration (for example, if someone were teaching a recipe in a food network style manner, but they were also emphasizing the food safety components to facilitate learning)?

If you wanted more information about food safety outside of your FDNS 2100 class, where would you turn to?

Thanks so much for your input on food safety, social media, and education. Good luck with the rest of the semester. As I noted before I will give Dr. Grossman a list of all who contributed to the discussion today for extra credit.

APPENDIX C

TREATMENT GROUP 1

Consent letter, pre/post-test**SafeEats-pre**

Dear potential participant:

I am a graduate student in the Department of Foods and Nutrition at The University of Georgia. I invite you to participate in a research study entitled "Social Media and Food Safety Education for College Students" that is being conducted under the auspices of Dr. Judy Harrison. The purpose of this study is to educate young adults on safe food handling and evaluate the use of social media to deliver these educational messages.

Your participation will involve becoming an active follower of a Facebook fan page devoted to food safety, along with completing a pre-test and post-test to examine the effectiveness of this education intervention and determine your opinions of the intervention. Both the pre-test and post-test will take approximately 10 minutes to complete. As a participant, you should spend approximately 15 minutes per week on the page. This time should include multiple visits to the fan page to watch videos and participate in polls and discussion. For your participation, you will receive 10 points of extra credit on a FDNS 2100 exam. If you do not wish to participate, extra credit can still be earned by completing an assignment evaluating research on food safety education (this assignment is fully explained in the handout available on ELC). Participation in this study will remain completely confidential and identifiers (your UGA e-mail) will be used only for purposes of assigning extra credit. The list of personal identifiers will be destroyed after extra credit has been assigned. In order to participate, you must be 18 years or older. Students under the age of 18 may complete the alternative extra credit assignment. Due to the nature of Facebook, when you discuss videos or poll questions on the fan page, your identity will be made public. Once the 4-week period has concluded, the fan page will be removed from Facebook, and your discussion will no longer be visible to the public. Researchers will make every effort to ensure confidentiality; however, there is a limit to the confidentiality that can be guaranteed due to the technology itself. Your participation is voluntary; you can refuse to participate or stop taking part at any time without penalty or loss of benefits to which you are otherwise entitled. The results of the research study may be published, but your identity will not be associated with your responses in any published format.

The findings from this project will help us evaluate a food safety education program for college students using social media. There are no known risks or discomforts associated with this research.

SafeEats-pre

If you have any questions about this research project, please feel free to contact me through the secretary at 706-542-3773 or send an e-mail to abram87@uga.edu.

Questions or concerns about your rights as a research participant should be directed to The Chairperson, University of Georgia Institutional Review Board, 612 Boyd GSRC, Athens, Georgia 30602-7411; telephone (706) 542-3199; email address irb@uga.edu.

By inputting your UGA e-mail and completing the pre-test, you are agreeing to participate in the above described research project.

Thank you for your time and consideration!

Sincerely,

Ashley Bramlett

UGA E-mail:

SafeEats-pre

Rate each of these statements below:

	Strongly disagree	Disagree	Neutral/not sure	Agree	Strongly agree
I believe my decisions and actions impact my risk for foodborne illness.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Food safety is an important issue to me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I want to gain additional knowledge about food safety.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe that foodborne illnesses are common.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

What food safety issues concern you?

SafeEats-pre

Using your knowledge of food safety information, check all the acceptable practices in each of the following questions. Each question may have more than one acceptable practice or none at all.

It's safe to defrost raw meat:

- on the kitchen counter.
- In the refrigerator.
- In the microwave followed by immediate cooking.
- In cold water that is changed every thirty minutes.

In the refrigerator, it's safe to store raw meat:

- on the top shelf.
- on the middle shelf.
- on the bottom shelf.

It's safe to eat refrigerated leftovers:

- for three to four days.
- for five to seven days.
- for seven to ten days.

To prevent food spoilage, the refrigerator temperature should be no higher than:

- 45°F
- 40°F
- 32°F

When packing a cooler for an outdoor event, I should:

- pack items that I will use first in the bottom of the cooler.
- pack ready to eat items on the top and raw meats on the bottom.
- pack beverages and food in two separate coolers.
- pack ready-to-eat items in one cooler and raw meats in a separate cooler.

SafeEats-pre**After cooking meat, I would:**

- serve the cooked meat on the same plate that I had the raw meat on.
- cut the cooked meat on the same plate that I had the raw meat on, but serve on a different plate.
- use a different plate to cut and serve the cooked meat.

I am cooking chicken that will be served cold with my lunch tomorrow. It is safe to:

- put the chicken in the refrigerator while the chicken is still hot.
- leave the chicken out to cool for 1 hour and then put the chicken in the refrigerator.
- cover the chicken, leave the chicken to cool overnight on the kitchen counter and then put the chicken in the refrigerator.

After handling raw meat, poultry, or fish, I clean my hands by:

- wiping them with a towel.
- rinsing them in cold water for at least 20 seconds.
- using hand sanitizer.
- washing them with soap and warm running water for at least 20 seconds.

I can tell if a burger is done if:

- it's browned on the outside.
- it springs back with the touch of a fork or spatula.
- the internal temperature is 160°F.
- it has been on the grill for 15 minutes.

After using a cutting board to trim chicken:

- I use a different board for vegetables or fruits.
- I use the same board, but I wash it thoroughly between uses.
- I wipe the cutting board with a dishcloth between uses.
- I spray the board with a sanitizer to clean it between uses.

SafeEats-pre**Gender:**

- Male
 Female

What is your current living situation?

- I live in a dorm room.
 I live in a shared apartment or house.
 I live in an apartment or house by myself.
 I live in my parents' residence.

How long have you lived away from your parent/guardian's home?

- less than 1 year
 1-2 years
 3 or more years
 does not apply

How often do you prepare meals for yourself?

- Never
 1-3 times per week
 4-6 times per week
 7-12 times per week
 More than 12 times per week

Have you ever been in a class or club where safe food handling practices were taught (ex. Family and Consumer Science classes, 4-H Club, etc)?

- Yes
 No

SafeEats-pre

Do you have any work experience in a restaurant or foodservice setting?

Yes

No

safeeats-post

On average, how much time did you spend on the Safe Eats facebook page each week?

- None
 1-14 minutes
 15-29 minutes
 30-60 minutes
 More than 60 minutes

Using the following scale, how do you feel about each of the following statements about food safety education?

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
-I enjoyed learning about food safety in a social media-based format.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-I am more interested in food safety topics now than before using the Safe Eats Facebook page.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-I learned more from the Safe Eats Facebook page than from the food safety lecture.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-I enjoyed the learning experience using the Safe Eats Facebook page more than the food safety lecture	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Rate each of the following forms of postings. Which type of posting did you feel was the most useful (1-most useful, 5-least useful)?

	1	2	3	4	5
Videos (Kitchen Q&A, Food Safety Game Plan, Food Safety Feud, Food Safe Fiesta)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Polls	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wall messages (Recall Basics, Egg Safety Update, Microwave Update, Expiration Dates Explained)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Discussion board	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

As a result of my participation, I plan to change the way I handle foods.

- Agree
 Disagree

safeeats-post

Please describe how you plan to change the way you handle foods.

Answer each of the following questions using the scale below.

	Very likely	Likely	Somewhat likely	Unlikely	Very unlikely
How likely are you to use Facebook to learn more about a health/safety topic in the future?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How likely are you to use the online resources given for food safety?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How likely are you to share food safety information with others?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please share any suggestions or comments that would help us improve the Safe Eats Facebook page for future use.

Class Handout

Students of FDNS 2100:

Hi, My name is Ashley Bramlett and I am working toward a Master's degree in Foods and Nutrition. My research involves examining the knowledge and attitudes of college students about food safety and the prevention of foodborne illnesses, and using social media to deliver food safety education.

I would like to invite all of you to participate in a part of my thesis project. I am building a Facebook fan page devoted to food safety education. The study will occur over a 4-week time period, in which participants will become active followers of the Facebook page. Every few days, I will post short videos, information and polls related to the food safety topics including: tailgating, recalls, recipe demos, and more. Your role is to watch these videos, participate in polls, and engage in discussion about the topics presented. As a participant, you will take an online pre-test before the 4-week period, and an online post-test after the 4 weeks have concluded. Both the pre-test and post-test will take approximately 10 minutes to complete. As a participant, you should spend approximately 15 minutes per week on the page. This time should include multiple visits to the fan page to watch videos and participate in polls and discussion.

The purpose of my thesis project is to develop meaningful food safety education for young adults and to find out if social media is an effective tool for the delivery of food safety education. The information generated will be published in my thesis and possibly in a research journal. Your identity will not be associated with your responses in any published format.

In order to participate, **you must first complete the consent form and pre-test that will be linked to your ELC homepage by Sunday, October 24, 2010.** Your UGA e-mail address will act as your signature in the consent form, and the use of your e-mail will be used only for the purposes of giving extra credit. Once you have completed both the consent form and the pre-test, you will be redirected to the Facebook fan page, and a link to the fan page will also be made available on your ELC homepage. Due to the nature of Facebook, when you discuss videos or poll questions on the fan page, your identity will be made public. Once the 4-week period has concluded, the fan page will be removed from Facebook, and your discussion will no longer be visible to the public. On the last day of the 4-week period, a link to the **post-test will be made available on your ELC homepage for you to complete prior to Friday, December 3, 2010.**

If you do not wish to participate, you can complete an alternative assignment for extra credit. You will not get extra credit for both the alternative assignment and participation, but rather you must choose to do one or the other. The alternative assignment involves investigating food safety education research. You will compare and contrast the research efforts of two different food safety educators. You will find two different peer-reviewed journal articles centered on food safety education. You must review each article and compare and contrast the two efforts and write a 2000 word synopsis of your research. To receive credit for the alternative assignment, you must submit the assignment through ELC by Friday, November 19, 2010.

If you have any questions or concerns, feel free to contact me at **abram87@uga.edu**.

I hope you will enjoy this opportunity to learn more about food safety. If you would like to participate, please be sure and **complete the pre-test by Sunday, October 24th.**

APPENDIX D

TREATMENT GROUP 2

Consent letter, pre/post-test**SafeEats-pretest2**

Dear potential participant:

I am a graduate student in the Department of Foods and Nutrition at The University of Georgia. I invite you to participate in a research study entitled "Social Media and Food Safety Education for College Students" that is being conducted under the auspices of Dr. Judy Harrison. The purpose of this study is to educate young adults on safe food handling and evaluate the use of social media to deliver these educational messages.

Your participation will involve becoming an active follower of a Facebook fan page devoted to food safety, along with completing a pre-test and post-test to examine the effectiveness of this education intervention and determine your opinions of the intervention. Both the pre-test and post-test will take approximately 10 minutes to complete. As a participant, you should spend approximately 15 minutes per week on the page. This time should include multiple visits to the fan page to watch videos and participate in polls and discussion. For your participation, you will receive 10 points to be added to your total points for FDNS 2100. If you do not wish to participate, extra credit can still be earned by completing an assignment evaluating research on food safety education (this assignment is fully explained in the handout available on ELC). Participation in this study will remain completely confidential and identifiers (your UGA e-mail) will be used only for purposes of assigning extra credit. The list of personal identifiers will be destroyed after extra credit has been assigned. In order to participate, you must be 18 years or older. Students under the age of 18 may complete the alternative extra credit assignment. Due to the nature of Facebook, when you discuss videos or poll questions on the fan page, your identity will be made public. Researchers will make every effort to ensure confidentiality; however, there is a limit to the confidentiality that can be guaranteed due to the technology itself. Your participation is voluntary; you can refuse to participate or stop taking part at any time without penalty or loss of benefits to which you are otherwise entitled. The results of the research study may be published, but your identity will not be associated with your responses in any published format.

The findings from this project will help us evaluate a food safety education program for college students using social media. There are no known risks or discomforts associated with this research.

If you have any questions about this research project, please feel free to contact me through the secretary at 706-542-3773 or send an e-mail to abram87@uga.edu. Questions or concerns about your rights as a research participant should be directed to

SafeEats-pretest2

The Chairperson, University of Georgia Institutional Review Board, 612 Boyd GSRC,
Athens, Georgia 30602-7411; telephone (706) 542-3199; email address irb@uga.edu.

By inputting your UGA e-mail and completing the pre-test, you are agreeing to
participate in the above described research project.

Thank you for your time and consideration!

Sincerely,

Ashley Bramlett

UGA E-mail:

SafeEats-pretest2

Rate each of these statements below:

	Strongly disagree	Disagree	Neutral/not sure	Agree	Strongly agree
I believe my decisions and actions impact my risk for foodborne illness.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Food safety is an important issue to me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I want to gain additional knowledge about food safety.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe that foodborne illnesses are common.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

What food safety issues concern you?

SafeEats-pretest2

Using your knowledge of food safety information, check all the acceptable practices in each of the following questions. Each question may have more than one acceptable practice or none at all.

It's safe to defrost raw meat:

- on the kitchen counter.
- in the refrigerator.
- in the microwave followed by immediate cooking.
- in cold water that is changed every thirty minutes.

In the refrigerator, it's safe to store raw meat:

- on the top shelf.
- on the middle shelf.
- on the bottom shelf.

It's safe to eat refrigerated leftovers:

- for three to four days.
- for five to seven days.
- for seven to ten days.

To prevent food spoilage, the refrigerator temperature should be no higher than:

- 45°F
- 40°F
- 32°F

When packing a cooler for an outdoor event, I should:

- pack items that I will use first in the bottom of the cooler.
- pack ready to eat items on the top and raw meats on the bottom.
- pack beverages and food in two separate coolers.
- pack ready-to-eat items in one cooler and raw meats in a separate cooler.

After cooking meat, I would:

- serve the cooked meat on the same plate that I had the raw meat on.
- cut the cooked meat on the same plate that I had the raw meat on, but serve on a different plate.
- use a different plate to cut and serve the cooked meat.

SafeEats-pretest2

I am cooking chicken that will be served cold with my lunch tomorrow. It is safe to:

- put the chicken in the refrigerator while the chicken is still hot.
- leave the chicken out to cool for 1 hour and then put the chicken in the refrigerator.
- cover the chicken, leave the chicken to cool overnight on the kitchen counter and then put the chicken in the refrigerator.

After handling raw meat, poultry, or fish, I clean my hands by:

- wiping them with a towel.
- rinsing them in cold water for at least 20 seconds.
- using hand sanitizer.
- washing them with soap and warm running water for at least 20 seconds.

I can tell if a burger is done if:

- it's browned on the outside.
- it springs back with the touch of a fork or spatula.
- the internal temperature is 160°F.
- it has been on the grill for 15 minutes.

After using a cutting board to trim chicken:

- I use a different board for vegetables or fruits.
- I use the same board, but I wash it thoroughly between uses.
- I wipe the cutting board with a dishcloth between uses.
- I spray the board with a sanitizer to clean it between uses.

SafeEats-pretest2**Gender:**

- Male
 Female

What is your current living situation?

- I live in a dorm room.
 I live in a shared apartment or house.
 I live in an apartment or house by myself.
 I live in my parents' residence.

How long have you lived away from your parent/guardian's home?

- less than 1 year
 1-2 years
 3 or more years
 does not apply

How often do you prepare meals for yourself?

- Never
 1-3 times per week
 4-6 times per week
 7-12 times per week
 More than 12 times per week

Have you ever been in a class or club where safe food handling practices were taught (ex. Family and Consumer Science classes, 4-H Club, etc)?

- Yes
 No

SafeEats-pretest2

Do you have any work experience in a restaurant or foodservice setting?

Yes

No

safeeats-post2

On average, how much time did you spend on the Safe Eats facebook page each week?

- None
 1-14 minutes
 15-29 minutes
 30-60 minutes
 More than 60 minutes

Using the following scale, how do you feel about each of the following statements about food safety education?

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
-I enjoyed learning about food safety in a social media-based format.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-I am more interested in food safety topics now than before using the Safe Eats Facebook page.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Rate each of the following forms of postings. Which type of posting did you feel was the most useful (1-most useful, 5-least useful)?

	1	2	3	4	5
Videos (Kitchen Q&A, Food Safety Game Plan, Food Safety Feud, Food Safe Fiesta)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Posts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wall messages (Recall Basics, Egg Safety Update, Microwave Update, Expiration Dates Explained)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Discussion board	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

As a result of my participation, I plan to change the way I handle foods.

- Agree
 Disagree

safeeats-post2

Please describe how you plan to change the way you handle foods.

Answer each of the following questions using the scale below.

	Very likely	Likely	Somewhat likely	Unlikely	Very unlikely
How likely are you to use Facebook to learn more about a health/safety topic in the future?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How likely are you to use the online resources given for food safety?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How likely are you to share food safety information with others?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please share any suggestions or comments that would help us improve the Safe Eats Facebook page for future use.

Class handout

Students of FDNS 2100:

Hi, My name is Ashley Bramlett and I am working toward a Master's degree in Foods and Nutrition. My research involves examining the knowledge and attitudes of college students about food safety and the prevention of foodborne illnesses, and using social media to deliver food safety education.

I would like to invite all of you to participate in a part of my thesis project. I have designed a Facebook fan page devoted to food safety education. The study will occur over a 4-week time period, in which participants will become active followers of the Safe Eats Facebook page. Every few days, I will post short videos, information and polls related to the food safety topics including: tailgating, recalls, recipe demos, and more. Your role is to watch these videos, participate in polls, and engage in discussion about the topics presented. As a participant, you will take an online pre-test before the 4-week period, and an online post-test after the 4 weeks have concluded. Both the pre-test and post-test will take approximately 10 minutes to complete. As a participant, you should spend at least 15 minutes per week on the page. This time should include multiple visits to the fan page to watch videos and participate in polls and discussion.

The purpose of my thesis project is to develop meaningful food safety education for young adults and to find out if social media is an effective tool for the delivery of food safety education. The information generated will be published in my thesis and possibly in a research journal. Your identity will not be associated with your responses in any published format.

In order to participate, **you must first complete the consent form and pre-test that will be linked to your ELC homepage by Sunday, January 23, 2011.** Your UGA e-mail address will act as your signature in the consent form, and the use of your e-mail will be used only for the purposes of giving extra credit. Once you have completed both the consent form and the pre-test, you will be redirected to the Facebook fan page, and a link to the fan page will also be made available on your ELC homepage. Due to the nature of Facebook, when you discuss videos or poll questions on the fan page, your identity will be made public. On the last day of the 4-week period, a link to the **post-test will emailed to you for completion prior to Friday, March 4, 2011.**

If you do not wish to participate, you can complete an alternative assignment for extra credit. You will not get extra credit for both the alternative assignment and participation, but rather you must choose to do one or the other. The alternative assignment involves investigating food safety education research. You will compare and contrast the research efforts of two different food safety educators. You will find two different peer-reviewed journal articles centered on food safety education. You must review each article and compare and contrast the two efforts and write a 2000 word synopsis of your research. To receive credit for the alternative assignment, you must email the assignment to abram87@uga.edu by Friday, March 4, 2011.

If you have any questions or concerns, feel free to contact me at **abram87@uga.edu**.

I hope you will enjoy this opportunity to learn more about food safety. If you would like to participate, please be sure and **complete the pre-test by Sunday, January 23rd.**

APPENDIX E
CONTROL GROUPS

Consent letter, pre/post-test

Control-pre

Dear potential participant:

I am a graduate student in the Department of Foods and Nutrition at The University of Georgia. I invite you to participate in a research study entitled "Social Media and Food Safety Education for College Students" that is being conducted under the auspices of Dr. Judy Harrison. The purpose of this study is to educate young adults on safe food handling and evaluate the use of social media to deliver these educational messages.

Your participation will involve completing a pre-test and post-test, and acting as a control group for our research study. Both tests will take approximately 10 minutes each to complete. After the study is complete, the educational materials used with the treatment will be available for your use. For your participation, you will receive 10 points of extra credit on a FDNS 2100 exam. If you do not wish to participate, extra credit can still be earned by completing an assignment evaluating research on food safety education (this assignment is fully explained in the handout available on ELC). Participation in this study will remain completely confidential and identifiers (your UGA e-mail) will be used only for purposes of assigning extra credit. The list of personal identifiers will be destroyed after extra credit has been assigned. Researchers will make every effort to ensure confidentiality; however, there is a limit to the confidentiality that can be guaranteed due to the technology itself. In order to participate, you must be 18 years or older. Students under the age of 18 may complete the alternative extra credit assignment. Your participation is voluntary; you can refuse to participate or stop taking part at any time without penalty or loss of benefits to which you are otherwise entitled. The results of the research study may be published, but your identity will not be associated with your responses in any published format.

The findings from this project will help us evaluate a food safety education program for college students using social media. There are no known risks or discomforts associated with this research.

If you have any questions about this research project, please feel free to contact me through the secretary at 706-542-3773 or send an e-mail to abram87@uga.edu. Questions or concerns about your rights as a research participant should be directed to The Chairperson, University of Georgia Institutional Review Board, 612 Boyd GSRC, Athens, Georgia 30602-7411; telephone (706) 542-3199; email address irb@uga.edu.

By inputting your UGA e-mail and completing the pre-test, you are agreeing to participate in the above described research project.

Control-pre

Thank you for your time and consideration!

Sincerely,

Ashley Bramlett

UGA E-mail:

| _____ |

Control-pre

Rate each of these statements below:

	Strongly disagree	Disagree	Neutral/Not sure	Agree	Strongly agree
I believe my decisions and actions impact my risk for foodborne illness.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Food safety is an important issue to me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I want to gain additional knowledge about food safety.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe that foodborne illnesses are common.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

What food safety issues concern you?

Control-pre

Using your knowledge of food safety information, check all the acceptable practices in each of the following questions. Each question may have more than one acceptable practice or none at all.

It's safe to defrost raw meat:

- on the kitchen counter.
- In the refrigerator.
- In the microwave followed by immediate cooking.
- In cold water that is changed every thirty minutes.

In the refrigerator, it's safe to store raw meat:

- on the top shelf.
- on the middle shelf.
- on the bottom shelf.

It's safe to eat refrigerated leftovers:

- for three to four days.
- for five to seven days.
- for seven to ten days.

To prevent food spoilage, the refrigerator temperature should be no higher than:

- 45°F
- 40°F
- 32°F

When packing a cooler for an outdoor event, I should:

- pack items that I will use first in the bottom of the cooler.
- pack ready to eat items on the top and raw meats on the bottom.
- pack beverages and food in two separate coolers.
- pack ready-to-eat items in one cooler and raw meats in a separate cooler.

After cooking meat, I would:

- serve the cooked meat on the same plate that I had the raw meat on.
- cut the cooked meat on the same plate that I had the raw meat on, but serve on a different plate.
- use a different plate to cut and serve the cooked meat.

Control-pre

I am cooking chicken that will be served cold with my lunch tomorrow. It is safe to:

- put the chicken in the refrigerator while the chicken is still hot.
- leave the chicken out to cool for 1 hour and then put the chicken in the refrigerator.
- cover the chicken, leave the chicken to cool overnight on the kitchen counter and then put the chicken in the refrigerator.

After handling raw meat, poultry, or fish, I clean my hands by:

- wiping them with a towel.
- rinsing them in cold water for at least 20 seconds.
- using hand sanitizer.
- washing them with soap and warm running water for at least 20 seconds.

I can tell if a burger is done if:

- it's browned on the outside.
- it springs back with the touch of a fork or spatula.
- the internal temperature is 160°F.
- it has been on the grill for 15 minutes.

After using a cutting board to trim chicken:

- I use a different board for vegetables or fruits.
- I use the same board, but I wash it thoroughly between uses.
- I wipe the cutting board with a dishcloth between uses.
- I spray the board with a sanitizer to clean it between uses.

Control-pre**Gender:**

- Male
 Female

What is your current living situation?

- I live in a dorm room.
 I live in a shared apartment or house.
 I live in an apartment or house by myself.
 I live in my parents' residence.

How long have you lived away from your parent/guardian's home?

- less than 1 year
 1-2 years
 3 or more years
 does not apply

How often do you prepare meals for yourself?

- Never
 1-3 times per week
 4-6 times per week
 7-12 times per week
 More than 12 times per week

Do you have any work experience in a restaurant or foodservice setting?

- Yes
 No

Control-pre

Have you ever been in a class or club where safe food handling practices were taught (ex. Family and Consumer Science classes, 4-H Club, etc)?

Yes

No

Class handout - control group 1

Students of FDNS 2100:

Hi, My name is Ashley Bramlett and I am working toward a Master's degree in Foods and Nutrition. My research involves examining the knowledge and attitudes of college students about food safety and the prevention of foodborne illnesses, and using social media to deliver food safety education.

I would like to invite all of you to participate in a part of my thesis project. Your role will involve completing a online pre-test before Sunday, October 24, 2010, and then following up with the online post-test, which you will asked to complete between November 20, 2010 and December 3, 2010. Both tests will take approximately 10 minutes each to complete. You will not be graded on the accuracy of your answers; we are interested in your opinions and actual knowledge of food safety.

The purpose of my thesis project is to develop meaningful food safety education for young adults and to find out if social media is an effective tool for the delivery of food safety education. The information generated will be published in my thesis and possibly in a research journal. Your identity will not be associated with your responses in any published format.

In order to participate, **you must first complete the consent form and pre-test that will be linked to your ELC homepage by October 24, 2010.** Your UGA e-mail address will act as your signature in the consent form, and the use of your e-mail will be used only for the purposes of giving extra credit. After a 4-week period has elapsed, you will receive an ELC message with a link to the post-test, and we ask that you **complete the post-test by December 3, 2010.**

If you do not wish to participate, you can complete an alternative assignment for extra credit. You will not get extra credit for both the alternative assignment and participation, but rather you must choose to do one or the other. The alternative assignment involves investigating food safety education research. You will compare and contrast the research efforts of two different food safety educators. You will find two different peer-reviewed journal articles centered on food safety education. You must review each article and compare and contrast the two efforts and write a 2000 word synopsis of your research. To receive credit for the alternative assignment, you must submit the assignment through ELC by Friday, November 19, 2010.

If you have any questions or concerns, feel free to contact me at **abram87@uga.edu**.

Class handout – control group 2

Students of FDNS 2100:

Hi, My name is Ashley Bramlett and I am working toward a Master's degree in Foods and Nutrition. My research involves examining the knowledge and attitudes of college students about food safety and the prevention of foodborne illnesses, and using social media to deliver food safety education.

I would like to invite all of you to participate in a part of my thesis project. Your role will involve completing a online pre-test before Sunday, January 23, 2011, and then following up with the online post-test, which you will asked to complete between February 19, 2010 and March 3, 2011. Both tests will take approximately 10 minutes each to complete. You will not be graded on the accuracy of your answers; we are interested in your opinions and actual knowledge of food safety.

The purpose of my thesis project is to develop meaningful food safety education for young adults and to find out if social media is an effective tool for the delivery of food safety education. The information generated will be published in my thesis and possibly in a research journal. Your identity will not be associated with your responses in any published format.

In order to participate, **you must first complete the consent form and pre-test that will be linked to your ELC homepage by January 23, 2011.** Your UGA e-mail address will act as your signature in the consent form, and the use of your e-mail will be used only for the purposes of giving extra credit. After a 4-week period has elapsed, you will receive a message with a link to the post-test, and we ask that you **complete the post-test by March 3, 2011.**

If you do not wish to participate, you can complete an alternative assignment for extra credit. You will not get extra credit for both the alternative assignment and participation, but rather you must choose to do one or the other. The alternative assignment involves investigating food safety education research. You will compare and contrast the research efforts of two different food safety educators. You will find two different peer-reviewed journal articles centered on food safety education. You must review each article and compare and contrast the two efforts and write a 2000 word synopsis of your research. To receive credit for the alternative assignment, you must email the assignment to abram87@uga.edu by Friday, March 3, 2011.

If you have any questions or concerns, feel free to contact me at **abram87@uga.edu**.

APPENDIX F

“SAFE EATS” LOGIC MODEL

