

2010

An analysis of the food safety educational processes in the Cooperative Extension System of the North Central Region of the United States

Vikram Swaroop Chandra Koundinya
Iowa State University

Follow this and additional works at: <http://lib.dr.iastate.edu/etd>

 Part of the [Rural Sociology Commons](#)

Recommended Citation

Koundinya, Vikram Swaroop Chandra, "An analysis of the food safety educational processes in the Cooperative Extension System of the North Central Region of the United States" (2010). *Graduate Theses and Dissertations*. 11216.
<http://lib.dr.iastate.edu/etd/11216>

This Dissertation is brought to you for free and open access by the Graduate College at Iowa State University Digital Repository. It has been accepted for inclusion in Graduate Theses and Dissertations by an authorized administrator of Iowa State University Digital Repository. For more information, please contact digirep@iastate.edu.

**An analysis of the food safety educational processes in the Cooperative Extension
System of the North Central Region of the United States**

by

Vikram Swaroop Chandra Koundinya

A dissertation submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Major: Agricultural Education
(Agricultural Extension Education)

Program of Study Committee:
Robert A. Martin, Major Professor

David A. Acker

Gerald A. Miller

Jack M. Payne

Michael S. Retallick

Iowa State University

Ames, Iowa

2010

Copyright © Vikram Swaroop Chandra Koundinya, 2010. All rights reserved.

TABLE OF CONTENTS

LIST OF FIGURES	vi
LIST OF TABLES	vii
ACKNOWLEDGMENTS	ix
ABSTRACT	x
CHAPTER 1. INTRODUCTION	1
Background information, situation, and the problem statement	1
Need for the study	5
Purpose & Objectives	6
Significance of the study	7
Definitions of selected terms	8
Constitutional definitions	8
Operational definitions	9
Summary	9
CHAPTER 2. REVIEW OF LITERATURE	12
U.S. and global food safety situation	13
Theoretical and conceptual framework	15
Characteristics and usefulness of perceptions	17
Cooperative Extension System	20
Adult Education	23
Brief history and assumptions about adult education	23
Adult education philosophies	25
Transactional modes of adult education	26
Teaching methods and tools	27
Educational processes and inservice education	32
Inservice education relative to the identified educational processes	35

Previous related studies	37
Summary	40
CHAPTER 3. METHODS	43
Research design	43
Data source	44
Sampling procedure	45
Instrumentation	46
Data collection	48
Data analysis	49
Assumptions made by the investigator	49
Limitations/delimitations of the study	50
CHAPTER 4. FINDINGS	52
Demographic information	53
Distribution of work experience	54
Distribution of age	54
Distribution of gender	54
Distribution of academic degrees	54
Perceptions of extension educators toward food safety	57
Importance and use of educational process components	58
Food safety educational processes related inservice needs	63
Perceived effectiveness of teaching methods and tools used in food safety educational programs	65
Extent of use of teaching methods and tools in food safety educational programs	67
Overall comments provided by extension educators	73
CHAPTER 5. DISCUSSION	74
Demographic information of extension educators	75

Perceptions of extension educators toward food safety	77
Perceptions of extension educators toward the educational processes related to food safety education	78
Food safety education process related inservice needs	82
Teaching methods and tools used in food safety educational programs	84
Food safety education delivery model for extension educators of the North Central Region	92
CHAPTER 6. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS	98
Summary	98
Conclusions	101
Recommendations	103
Recommendations for action	103
Recommendations for further research	103
Implications and significance to agricultural &/or agricultural extension education	104
APPENDIX A. INSTITUTIONAL REVIEW BOARD APPROVAL FORM	107
APPENDIX B. INSTITUTIONAL REVIEW BOARD APPROVAL MODIFICATION FORM	112
APPENDIX C. INFORMED CONSENT AND INTRODUCTION LETTER	116
APPENDIX D. APPROVED SURVEY QUESTIONNAIRE	118
APPENDIX E. FOLLOW-UP LETTER	126
REFERENCES	128

LIST OF FIGURES

Figure 1. Frequency distribution of extension educators based on their gender	54
Figure 2. Frequency distribution of extension educators based on their academic degree	54
Figure 3. Statewise mean scores of extension educators based on their perceptions about food safety	56
Figure 4. Food safety education delivery model	94

LIST OF TABLES

Table 1	54
Mean and standard deviation scores of extension educators based on their work experience and age	
Table 2	55
One-way <i>ANOVA</i> among the extension educators of the different states of NCR based on their perceptions about food safety	
Table 3	57
Frequency distribution, mean, and standard deviation scores of extension educators based on their perceptions about food safety	
Table 4	58
Mean and standard deviation scores for the perceived importance and extent of use of the identified educational process components	
Table 5	60
One-way <i>ANOVA</i> among the states of NCR based on extension educators' perceived importance of the educational process components	
Table 6	61
One-way <i>ANOVA</i> among the states of NCR based on extension educators' extent of use of the educational process components in food safety educational programs	
Table 7	62
Paired samples <i>t</i> -Test between the perceived importance and extent of use of food safety educational processes	
Table 8	63
Mean and standard deviation scores for the food safety educational process related inservice needs	
Table 9	64
One-way <i>ANOVA</i> for the educational processes related inservice needs of extension educators by state	
Table 10	65

Mean and standard deviation scores of extension educators based on their perceived effectiveness of teaching methods and tools used in food safety educational programs	
Table 11	67
One-way <i>ANOVA</i> for the perceptions of extension educators by state about the effectiveness of brochures in conducting food safety educational programs	
Table 12	67
Mean and standard deviation scores of extension educators based on the extent of use of teaching methods and tools in food safety educational programs	
Table 13	69
One-way <i>ANOVA</i> for the extent of use of lecture method in food safety educational programs by extension educators by state	
Table 14	69
One-way <i>ANOVA</i> for the extent of use of WebCt and newsletters in food safety educational programs by extension educators by state	
Table 15	70
Paired samples <i>t</i> -test between the extension educators' perceived effectiveness and extent of use of teaching methods used in conducting food safety educational programs	
Table 16	71
Paired samples <i>t</i> -Test between the extension educators' perceived effectiveness and extent of use of teaching tools used in conducting food safety educational programs	

ACKNOWLEDGMENTS

I would like to express my sincere appreciation to my major professor Dr. Robert A. Martin for his constant support and guidance throughout this program. His inputs to this research were invaluable. I am grateful to him for respecting my views. He is an adult educator in the real sense of it. He was very considerate of all my needs as a graduate student and supported me with an assistantship and professional development monies.

I would also like to express my sincere thanks to my other committee members Dr. David Acker, Dr. Gerald Miller, Dr. Jack Payne and Dr. Michael Retallick for their inputs to this research work. Special thanks to Dr. Acker and Dr. Payne for financially supporting me to attend professional conferences that gave me good exposure to the latest research in the field.

I am extremely thankful to Dr. Mary Holz-Clause and Ray Hansen for all their support. They were always there for me whenever I needed any help. I will highly value all their help. Special thanks to Dr. Mack Shelley for his time and other inputs toward data analysis of this research work. I would also like to thank Dr. Gaylan Scofield for helping me with my data collection.

I am grateful to my family members for their support and affection. My sincere thanks are due to all my dear friends here at Iowa State and one from India for their good wishes. Special thanks to Dr. Rangan for his unconditional friendship.

This section would be incomplete without expressing my heart-felt profound gratitude to my Teacher who has made me realize the real value of education. I am grateful to him for his causeless and unceasing love.

ABSTRACT

Literature suggests that food safety is a serious concern all over the world, and lack of it has huge health and economic implications to different stakeholders. The situation in the U.S. is also no different with most of the American public not much knowledgeable about agriculture and food safety. Therefore, food safety education assumes importance. There are many food safety education providers in the U.S. with the Cooperative Extension System (CES) of the land-grant institutions being the most reliable one.

The purpose of this study was to analyze the perceptions and extent of use of food safety educational processes by extension educators in the CES of the North Central Region of the United States. Extension educators': (1) perceptions toward food safety and various components related to food safety educational processes, (2) their inservice need for the identified educational processes, and (3) the extent to which they were using the identified teaching methods and tools in their food safety educational programs were analyzed in order to accomplish the purpose of the study.

Data were collected by using an expert panel-reviewed and reliability-tested electronic questionnaire from extension educators in the program areas of Family and Consumer Sciences and Agriculture and Natural Resources, and the County Extension Directors (CEDs). A disproportionate stratified random sample of 64 extension educators from each of the 12 states of NCR was drawn, amounting to a sample size of 768. The findings were based on the 325 usable questionnaires out of the 416 that were returned.

It was found that a typical extension educator (as operationally defined) was a middle-aged female with substantial years of work experience and held a master's degree. Extension educators had neutral perceptions about food safety, and were in need of inservice

education on all five identified food safety inservice educational processes. Further, extension educators perceived most of the educational processes to be important and the identified teaching methods and tools to be effective for conducting food safety educational programs. It was further found that extension educators were using discussions and brochures to the greatest extent compared to the other teaching methods and tools, respectively, in their food safety educational programs.

One-way *ANOVA* analysis indicated that the findings overall were consistent among the extension educators of the NCR implying that they could be generalized to the entire population. Hence, a food safety education delivery model was developed for extension educators of the NCR that has implications for both inservice education of extension educators and delivery of information to clients. The model was predominantly based on the findings from this study and a review of the literature.

CHAPTER 1

Introduction

Background Information, Situation, and the Problem Statement

Food is a basic human need and consumption of safe food is essential for avoiding foodborne illnesses. Food safety is an important global issue with international trade and public health implications (Buzby, 2001). The incidence of food related illnesses is increasing all over the world (Motarjemi & Kaferstein, 1999), and any country regardless of its stage of development can be affected by foodborne diseases (Kaferstein & Abdussalam, 1999; Motarjemi & Kaferstein). Foodborne diseases may range from a mild stomach ache (Pennsylvania Impact, 1999) to being very deadly (Motarjemi & Kaferstein). Food related illnesses are a serious issue in the United States (Ellis, 2006), and as a result Americans' are concerned about food safety (Gilmore, Meehan-Strub, & Mormann, 1992; Nordstrom, Wilson, Richards, Fivek, Ruffing, & Coe, 1999).

“Food-borne illness is a major source of morbidity and mortality” (Parnes, Idell, Antasia, & Lichtenstein, 2003, p.174). One in every four persons in the United States suffers from foodborne illness each year (Guion, Simonne, & Easton, 2004). Around 76 million cases of foodborne diseases occur annually in the United States and it is estimated that there are 325,000 hospitalizations and 5,000 deaths annually owing to foodborne diseases (Centers for Disease Control and Prevention (CDC), 2007). About 400-500 foodborne outbreaks are reported by the local and state health departments each year to the CDC. These numbers represent only a fraction of the actual numbers, as only a small percentage of the cases get reported (Iowa State Department of Public Health, 2008).

Food is very important to the people of United States. “Eating could very well be called America’s national pastime” (Pennsylvania Impact, 1999, p.1). Americans like everything from “...gourmet cooking, fast food, meat and potatoes, seafood and vegetables” (Pennsylvania Impact, p.1). Food safety is a legitimate problem in the United States (Barton & Barbeau, 1992). In addition to the health concerns, foodborne illnesses have severe economic implications. It is reported that the monetary loss could be up to \$7 million for a chain of foodservice operations in a metropolitan area for a single outbreak of a foodborne illness. Further, for a small business this cost could be so high that it could challenge its very survival, indicated how serious a public concern food safety is in the United States (Guion, Simonne, & Easton, 2004). Therefore, it becomes essential to educate the public to the “...reality that there is no such thing as absolute safety. Regulation can never completely and totally protect the public” (Kennedy, 1978 as cited by Wilcock, Pun, Khanona & Aung, 2004, p.56), and also on the proper food safety mechanisms and technologies.

The National Research Council (NRC) (1988) has identified that much of the general public in the United States is unaware of where and how the food they eat is produced. People of the United States are not knowledgeable about agriculture (Blackburn, 1999) and food safety (Altekruse, Steet, Fein & Levy, 1995). Ten Eyck and Deseran (2001) found that almost a majority of the oyster harvesters in Louisiana had never heard about food irradiation. This lack of knowledge about agriculture (California Department of Education, 2005) and food safety challenges agricultural education. Also, food safety is a scientifically complex issue, and the principles underlying food safety and risk are not properly understood

by the general public (Barton & Barbeau, 1992), which indicates that trained educators should educate the public on food safety.

There are different organizations that are educating the general American public on food safety in a variety of educational settings. The Cooperative Extension System (CES) of the land-grant universities providing education in nonformal settings is one of the educational arms providing food safety education. Extension professionals have been educating people on food safety for many years (Barton & Barbeau, 1992). Food safety education is an important part of the extension programs (Jayaratne, Harrison, & Bales, 2009). One of the priority issues in the educational programming of the CES is food safety (Barton & Barbeau, 1992). Gentry-Van Laanen and Nies (1995) found that the food safety educational programs offered by Extension were successful in bringing about a change in food safety behaviors of clients. On a similar note, Dean et al., (2008) found that a food safety workshop conducted by Extension in the tri-states of Louisiana, Mississippi and Arkansas resulted in an increase of knowledge and adoption of recommended food safety practices.

Food safety education has been an integral part of the educational priorities of the CES. USDA's National Institute of Food and Agriculture (formerly Cooperative State Research Education and Extension System), the federal partner of CES awards integrated research, education and extension grants that address a wide range of food safety problems through the National Integrated Food Safety Initiative (NIFSI) (NIFSI, 2010). NIFSI awards \$15 million every year in food safety grants that use an integrated approach (research, education and extension) for providing solutions to complex food safety issues. The fact that NIFSI has awarded more than 180 such grants since 2000 speaks for the importance of food safety as an educational priority for the CES (Singleton & Hillers, 2006).

Research has shown the positive aspects of educating people on food safety. Wipon, Rodolfo, and Nichols (2003) found that consumers' knowledge about food irradiation increased after they were provided with information. Also, their perceptions toward buying irradiated food became favorable. It was reported that consumer preferences toward food safety technologies like irradiation changed to positive in response to the educational messages about food safety (Frenzen, Majchrowicz, Buzby, & Imhoff, 2000). DeReuiter and Dwyer (2002) stated that educating people will bring about the acceptance of food safety practices like irradiation.

It can be deduced from the forgoing discussion that extension educators are positioned uniquely to educate the public on food safety issues. Also, the literature suggests that food safety education has been offered by the CES for many years indicating that extension educators may be knowledgeable about food safety issues. But, according to James Shanteau's Theory of Expert Competence, the knowledge domain is only one of the five factors associated with the competence of experts (Shanteau, 1992). This means, it is not sufficient if extension educators are proficient only in the knowledge domain related to food safety but also in the educational processes used in conducting educational programs on this topic.

A thorough review of the literature indicated that there were no known research studies conducted on the educational processes aspect related to food safety education. In order to understand this aspect of food safety education, it is important to know the answers to the following questions:

1. What are the perceptions of the extension educators toward food safety and the educational processes used in conducting educational programs on this topic?

2. What are the different teaching methods and tools extension educators are using to educate their clients on this topic?
3. What are the extension educators' inservice needs related to the educational processes related to food safety education?

This study aimed at analyzing the perceptions of the extension educators in the program areas of Family and Consumer Sciences and Agricultural and Natural Resources, and County Extension Directors (CED) in North Central Region (NCR) of the United States toward food safety and the educational processes used in conducting educational programs on this topic; the different teaching methods and tools being used by the extension educators in educating clients about food safety; and identifying the inservice needs of extension educators related to the food safety educational processes.

Need for the Study

It is a well documented fact that food safety is a serious concern in the United States (Ellis, 2006; Nordstrom et al., 1999; Barton & Barbearu, 1992), and also there is no such thing as absolute safety regarding food (Kennedy, 1978 as cited by Wilcock et al., 2004). This has serious implications for both the general public health (CDC, 2007) and to the economy (Guion, Simmone, & Easton, 2004). In this context it becomes essential that people should get properly educated on food safety so they can adopt safe food behaviors and stay healthy. One of the programming priorities for extension educators in the CES is food safety (Jayaratne et al., 2009). Also, CES is the largest nonformal educational organization in the United States that offers education to the general public (Franz, 2007). As discussed earlier, it is essential that extension educators be educated on the educational processes used

in conducting educational programs on food safety. This study could provide information toward accomplishing this purpose.

The review of literature indicates that there has been no known research conducted on the food safety educational processes used by extension educators either in the NCR or anywhere else in the United States. There have been some studies that studied the perceptions of extension educators toward the educational processes related to livestock waste management (Kwaw-Mensah, 2008), water quality issues (Camara, 2006), and sustainable agriculture (Jayaratne, 2001) but there is no known study that has compared and contrasted the results among the 12 states in the NCR. Also, there is no known research study that has identified the food safety educational process related inservice needs of the extension educators. This study was aimed at contributing information that could be used for the successful education of Extension's clients regarding food safety education, and also for designing inservice educational programs for extension educators.

Purpose & Objectives

The purpose of this study was to analyze the perceptions and extent of use of food safety educational processes by extension educators in the Cooperative Extension System of the North Central Region of the United States. The following specific objectives were formulated toward accomplishing the purpose of this study.

To identify and analyze:

1. The perceptions of extension educators toward food safety;
2. The perceptions of extension educators toward the educational processes related to food safety education;
3. The food safety educational processes related inservice needs of extension educators;

4. The perceptions of extension educators regarding the effectiveness of different teaching methods and tools for food safety education; and
5. The extent of use of the different teaching methods and tools by the extension educators in food safety education.

Significance of the Study

The significance of this study is four-fold:

1. Analyzing the perceptions of the extension educators would help us understand their probable behaviors (Dijksterhuis & Bargh, 2001; Ferguson & Bargh, 2004), knowledge levels (Royce, 1974 as cited by Hentschel, Smith, & Draguns, 1986; Maund, 2003), and world-views and experiences (Jayaratne, 2001) related to food safety education, all of which could be used in improving the existing, and designing future food safety educational programs.
2. Identifying the teaching methods and tools extension educators were using in educating clients about food safety issues could be used in understanding the philosophical and theoretical groundings/frameworks extension educators were adopting in their educational programming. Also, this would let us know whether or not extension educators were using learner-centered teaching methods. This information could be used in designing inservice educational workshops for them.
3. Identifying the food safety educational process related inservice needs could be used in developing the curriculum for inservice education workshops for extension educators.

4. Comparing and contrasting the results among the 12 states of the NCR could be useful in identifying any statistically significant differences that may exist among the states related to food safety educational programming.

Definitions of Selected Terms

Constitutional definitions.

1. Food Safety Education: The educational processes that foster “Protecting the food supply from microbial, chemical (i.e. rancidity, browning) and physical (i.e. drying out, infestation) hazards or contamination that may occur during all stages of food production and handling-growing, harvesting, processing, transporting, preparing, distributing and storing” (Rhode Island Food Safety Education, Cooperative Extension, 2000).
2. Extension: “Conscious use of communication of information to help people form sound opinions and make good decisions” (Van den Ban & Hawkins, 1996. p.9).
3. Education: “Bringing about desirable changes in knowledge (things known), attitudes (things felt) and skills (things done), either in all, or one or more of them” (Reddy, 1993, p.7).
4. Extension Education: “An applied science consisting of content derived from research, accumulated field experiences and relevant principles drawn from the behavioural sciences synthesised with useful technology into a body of philosophy, principles, content and methods focussed on the problems of out-of-school education for adults and youth ” (Leagans, 1961 as cited by Reddy, 1993, p.3).
5. Extension educational process: “The composite of actions where an Extension educator conducts a situational analysis of individual and community needs,

establishes specific learning objectives, implements plan of work and evaluates the outcomes of the instruction to determine o[i]f behavioral changes have occurred” (Seevers, Graham, Gamon, & Conklin, 1997, p.246).

6. North Central Region: The North Central Region consists of the states of Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota and Wisconsin (Sustainable Agriculture and Research Education, 2008).
7. Perceptions: “A personal view or judgment about a phenomenon, issue, activity, method, or practice” (Camara, 2006, p.9).
8. Inservice education: Inservice training is the “training provided for someone during employment” (Camara, 2006, p.9).

Operational definitions.

1. Perceptions: The mean score on a set of statements on a five-point Likert type scale on the perceptions of extension educators toward food safety and the educational processes used in conducting educational programs on this topic.
2. Extension Educator: Extension Educators of the CES in the program areas of Family and Consumer Sciences and Agricultural and Natural Resources working at the county and regional area offices, and the county extension directors in the NCR. The educators working in horticulture, dairy, beef, cattle, farms, plant protection, insects, and forestry were considered as Agricultural and Natural Resource educators.

Summary

This chapter was organized under the sections: background information and problem statement, need for the study, purpose and objectives, significance of the study, and

definitions of the selected terms. Foodborne illnesses have been identified as a serious concern in the United States, and have severe health and economic implications. It has been reported that absolute safety of food is not possible in spite of the strict regulatory policies in place. Added to this, the general public of the United States is not well educated about agriculture and food safety issues. In this context, food safety education assumes significance.

Extension educators working in the CES are positioned uniquely to educate the general public in nonformal educational settings. The CES has been offering educational programs relative to food safety for the past many years, and it is reasonable to assume that such extension educators will be knowledgeable on food safety issues. But, The Theory of Expert Competence proposed by James Shanteau posits that knowledge is not the only required factor for competence. This information indicates that extension educators should be educated not only on the technical aspects of food safety but also on the educational processes involved in conducting educational programs on this topic. Hence, it becomes essential to know: what are the perceptions of extension educators toward food safety and the educational processes used in conducting educational programs on this topic; what are the different teaching methods and tools the extension educators are using to educate their clients on this topic; and what are their inservice needs related to the educational processes on food safety.

There has been no known research conducted analyzing the perceptions and educational processes used by food safety extension educators. There have been some studies that studied the perceptions of the extension educators toward the educational processes related to different agricultural content areas but there is no study that has

compared and contrasted the results among the 12 states in the NCR. Also, there is no known research study that has identified the food safety educational processes related inservice needs of extension educators. This study was aimed at contributing information that could be used for the successful education of Extension's clients for food safety education and also for designing inservice educational programs for extension educators.

CHAPTER 2

Review of Literature

Food safety is a serious concern in the United States. Therefore, education about food safety is important so people can adopt safe food behaviors. Education on food safety is being offered by educators in a variety of settings. Extension educators in the CES are uniquely positioned to educate the general public and farmers on food safety issues because Extension has been educating people of the United States for more than 100 years now. There is little known research available on the educational processes used by extension educators in conducting food safety educational programs. To ascertain the status, and improve the existing food safety educational programs it is essential to analyze the perceptions of extension educators toward food safety and the educational processes related to food safety education; the different teaching methods and tools being used by extension educators in food safety education; and the educational processes related inservice needs of extension educators. This chapter focuses on these three components reviewing literature on the U.S. and global food safety situation, the construct ‘perceptions’ and its importance, the CES, adult education (philosophy, theory, and teaching methods and aids), educational processes and inservice education.

This chapter is divided into seven sections. A brief review of the food safety situation in the U.S. and globally is provided in section one. The theoretical and conceptual frameworks that guided the study are described in section two. The characteristics and usefulness of ‘perceptions’ is presented in section three. Section four gives a brief review of the history, importance, and functions of CES. Adult education philosophies, theories, and the different teaching methods and aids employed in adult education are described in section

five. Section six briefly describes the different educational processes and need for inservice education on these processes. Finally, section seven presents research findings from related past studies.

U.S. and Global Food Safety Situation

Food safety concerns are increasing all over the world (Motarjemi & Kafarstein, 1999; World Health Organization (WHO), 2007). “Foodborne illnesses represent a major and daily health threat in all countries, from the most to the least developed” (De Waal & Robert, p. 66). In 2005 alone, 1.8 million people died globally of diarrhoeal diseases caused due to lack of food and water safety (WHO, 2007). This is more severe in children under five with an estimated 3 million premature deaths (WHO, 1999). The problem is more severe in the developing countries to an extent that foodborne illnesses “...have become a fact of everyday life.” (Motarjemi & Kafarstein, p.326).

Food Safety Asia (2010) reported that more than 700,000 people succumb to food and waterborne diseases every year in the Asia Pacific region. The situation in Africa is also alarming with acute food poisoning outbreaks being a common occurrence (De Waal & Robert, 2005). Food and Agriculture Organization (FAO) (2004) and the WHO (1999) have reported that the health and economic implications associated with lack of food safety are enormous.

The situation in industrialized countries is also not very different, with a growing concern over food related health risks among the public (Otsuki, Wilson, & Sewadeh, 2001). WHO (2007) has reported that 30% percent of the population in industrialized countries are suffering with foodborne illness every year. The food safety concerns have been on a rise in these countries over the past 2 to 3 decades (Kafarstein, Motarjemi, & Bettcher, 1997). And,

the consumers are demanding safe food (Buzby, 2003). The Pacific island countries reported one foodborne illness per every 100 individuals between 1996 and 1999, with 5.4 million cases of foodborne gastroenteritis reported annually in Australia alone (De Waal & Roberts, 2005).

Coming to the situation in the U.S., despite its strict food safety policies and regulation, 76 million cases of foodborne illnesses with an estimated 5,000 deaths occur every year (CDC, 2007; WHO, 2007). Guion, Simonne, and Easton (2004) reported that $\frac{1}{4}$ th of population of the United States suffers from foodborne illness every year. In addition, a majority of the people of United States are ignorant about agriculture (Blackburn, 1999). Therefore, educating consumers about food safety is necessary for decreasing the foodborne illnesses in the U.S. (Taylor & Curtis, 1999).

Research shows the utility of educating consumers about food safety in order to reduce the incidence of foodborne diseases (Meer & Misner, 2000; Patil, Cates, & Morales, 2005). Laminack, Dainello, Degenhart, Vestal, and Wingenbach (2008) found that an experiential educational course resulted in a significant knowledge gain about food irradiation, a safe food technology. Also, Wardlaw (1999) found that a food safety education project brought about a change in participant's behaviors toward reducing the risk of foodborne diseases from E.coli O157:H7.

Further, an urgent need for education about food safety is being increasingly felt than ever before with universities delivering online courses for people at a distance. One example is the College of Agricultural and Life Sciences at Iowa State University that offers a Food Safety and Defense Graduate Certificate for food industry personnel, food-related professionals and graduate students (AGCareers.com, 2010). All this clearly indicates that

educating consumers about food safety is one of the crucial components in achieving food safety. A review of the theoretical framework and the conceptualizations that were framed based on the theory to help guide this study are presented in the next section.

Theoretical and Conceptual Framework

The theory of planned behavior (TPB) proposed by Icek Ajzen served as the theoretical framework for this study. Research findings from studies conducted on ‘perceptions’ in experimental psychology provided support to the theoretical framework. According to the TPB, a person’s intentions to perform behaviors can be predicted from three variables: 1. attitudes toward the behavior, 2. subjective norms, and 3. perceived behavioral control. Intentions and perceived behavioral control are the major factors influencing a person’s actual behavior (Ajzen, 1991). Ajzen (2006) stated that attitude toward a behavior is the value placed in performing that behavior while the subjective norm is the perceived social pressure whether or not to engage in that behavior, and perceived behavioral control is a person’s perception of his/her ability to perform a given behavior.

TPB is an extension of the Theory of Reasoned Action (TRA) proposed by Fishbein and Ajzen (Madden, Ellen, & Ajzen, 1992). The addition of perceptions on behavioral control distinguishes TPB from TRA. It can be seen from the TPB that perceptions are one of the major predictors of behavior. This means, extension educators’ perceptions could influence their behaviors. Hence, it could be conceptualized that extension educators’ perceptions about food safety, educational processes involved in conducting educational programs on food safety, and inservice needs related to these processes can influence

behavioral traits like wanting to have more instructional materials, adopting different teaching methods and tools, and attending inservice workshops.

Research (Bargh, Chen, & Burrows, 1996; Brewer, Weinstein, Cuite, & Herrington, 2004; Chartrand & Bargh, 1999; Chen & Bargh, 1997; Dijksterhuis & Bargh, 2001; Dijksterhuis & van Knippenberg, 1998; Ferguson & Bargh, 2004; Gordon, 2002) indicates that peoples' behaviors are influenced by their perceptions. Dijksterhuis and Bargh (2001) and Ferguson and Bargh (2004) worked on human subjects and found that perceptions toward a behavioral trait do influence the related behavior. Dijksterhuis and Bargh stated that "There is a direct link between perception and action" (p.11). Ferguson and Bargh found that perception of a stimulus inevitably activates knowledge, and this influences behavior. They purported that "...behavior is automatically shaped and guided by the knowledge that is incidentally activated during perception..." (p.34). Knowledge that is activated while perceiving a particular action can lead to the performance of that action. And, this can influence even complex behaviors (Ferguson & Bargh).

Based on the findings of the two studies it could be reasonably inferred that extension educators with favorable or positive perceptions toward food safety, the educational processes related to food safety, and high need for inservice education will behave differently from those with negative perceptions. Extension educators could be more interested to learn about food safety, food safety educational processes, and adopt innovative teaching strategies. Also, they are more likely to attend inservice workshops.

Dijksterhuis and Bargh (2001) stated that certain factors facilitate or inhibit perceptions getting translated into behavior. Despite the presence of these factors it can still

be said that perceptions do have an effect on human behavior. However, removing the inhibitory factors increases the effect of perceptions on behavior, and if there is no inhibitor, perceptions translate into behavior (Dijksterhuis & Bargh). Some inhibitory factors for extension educators could be varying demographics, lack of sufficient knowledge about food safety and the educational processes related to food safety, and lack of competence in using different teaching methods and tools. Most inhibitory factors could be addressed through inservice education.

In conclusion, the TPB proposes perceptions about behavioral control as one of the most important predictors of the actual behavior. And, research in experimental psychology supports the view that perceptions pave the way to actual behavior. Hence it was conceptualized that perceptions of extension educators toward different aspects of food safety education could influence their behavior related to the same.

Characteristics and usefulness of perceptions. This section examined the characteristics of perceptions and contextualized them to this study. Van den Ban and Hawkins (1996) defined perception as “The process by which we receive information or stimuli from our environment and transform it into psychological awareness” (p.59 & 282). According to Schunk (2008) perception is “attaching meaning to environmental inputs received through the senses” (p.141). Camara (2006) defined perception as “A personal view or judgment about a phenomenon, issue, activity, method, or practice” (p.9). Further, perceptions involve selection and organization of material from outside environment to provide meaning to our experiences (Universal Teacher Publications, 2009).

It is indicative from the above definitions that perceptions result in awareness, meaning making, and judgment about the perceived object. This could mean that perceptions

of extension educators about food safety and educational processes related to food safety could result in awareness and judgments about the same, which in turn could affect their behavior related to educational programming. Jayaratne (2001) analyzed the perceptions of the extension educators in the NCR of the U.S. toward sustainable agriculture and found that perceptions help understand the world-views and experiences of extension educators. The perceptions of extension educators could help us understand their views and experiences about food safety and educational programming on this topic which could be used in developing future inservice workshops.

Universal Teacher Publications (2009) stated that perception is a very complex process, and involves a complex interaction of selection, organization, and interpretation. They further stressed that despite its reliance on the senses for obtaining raw data, the perceptual process tends to amalgamate, improve and change this data due to interaction. Perceptions add as well as deduct from the sensory world (Universal Teachers Publications). This means, extension educators are likely to analyze and synthesize the perceived information about food safety and the educational processes related to it, which are higher order cognitive skills according to Bloom's taxonomy. As a result of this, the end product could be meaningful and may have implications for designing food safety educational processes and for inservice education.

Maund (2003) defined perception as "... a process by which we acquire knowledge of an objective world" (p.1). According to the Aristotelian approach, perception is a "... natural process or activity whereby the perceiver comes to acquire knowledge of things in the world in which the perceiver is situated" (pp.23-24). Perception is one of the three pathways by which people can acquire knowledge (Royce, 1974 as cited by Hentschel, Smith, and

Draguns, 1986). Maund stated that perception serves in acquisition of practical knowledge (both ordinary and scientific) and justification of knowledge claims. This means, extension educators with favorable or positive perceptions may want to acquire more knowledge on food safety and food safety educational processes. Inservice workshops could be one of their knowledge acquiring avenues.

If the extension educators end up acquiring some knowledge due to favorable perceptions it may have further implications. According to Rogers (1995), knowledge is the first stage in the innovation-decision process that ends with a confirmation stage. The four stages in the innovation-decision process are knowledge, persuasion, decision, and confirmation. So it could be reasonably assumed that knowledge gained as a result of favorable perceptions may lead extension educators to make informed decisions about their educational programs related to food safety.

According to Hentschel, Smith, and Draguns (1986), perception abides by some general laws, is an event over time rather than an instantaneous reaction to outside stimulation, has its roots beyond awareness, often related with the observer's private world and emotional experiences, and culminates in conscious representation and meaning. Maund (2003) stated that the perceptual experiences are means of discriminating objects, guides to action, are connected with the perceptual thoughts and beliefs, and form the basis for judgments. Armstrong (1988) stated that "Perception is a continuous 'mapping' of what is going on in the environment" (p.128), and these maps have the character of intentionality. This suggests that perception is not a random or instantaneous process, but is selective (Graf & Platen, 1985). Also, perceptions guide actions, form the basis for judgments, and are deliberate.

In summary, perceptions are intentional and deliberate events that result in awareness and judgments about the object being perceived. Also, they let us know the world views of the perceiver and involve analysis and synthesis of the information being perceived. They are one of the ways of acquiring knowledge and are guides to behavior. Hence, exploring and analyzing the perceptions of extension educators about food safety and educational processes related to conducting educational programs on food safety is important to improve the food safety educational programming in the CES.

Cooperative Extension System

The research subjects for this study were the extension educators working for the CES. Therefore, a brief review of the different aspects related to the CES is provided in this section. The Cooperative Extension System (CES) is the outreach arm of land-grant universities (McDowell, 2001), and was established by the Smith-Lever Act of 1914 (Association of Public and Land-Grant Universities, 2009; Seevers, Graham, Gamon, & Conklin, 1997). The CES is the largest nonformal educational organization in the United States (Fiske, 1989; Franz, 2007).

The CES is a "...Public funded, nonformal, educational system that links the education and research resources of the United States Department of Agriculture, land-grant universities, and county administrative units" (Seevers et al., 1997, p.1 & 244). The CES was instrumental in making the American agricultural revolution possible that increased farm productivity (Singleton & Hillers, 2006). The mission of Extension as written in the Smith-Lever Act was "... to aid in diffusing among the people of the United States useful and practical information on subjects relating to agriculture and home economics, and to

encourage the application of the same...” (Smith-Lever Act of 1914 as cited in Seevers et al, p.7).

The fundamental purpose of the CES is to educate people so they can make decisions important to their lives on their own (Seevers et al., 1997). The purposes of the CES are (McDowell, 2001, p.69):

1. To seek to know the problems of ordinary people and to bring those problems to the attention of the researchers.
2. To deliver functional education, based on the best scholarship available, to ordinary people, to help solve their problems.
3. To collect political support from the beneficiaries of extension programs in order to fund the continued research and education of ordinary people of the society – not just, or even primarily, farmers.

It can be deduced from the literature cited above that the CES is primarily concerned with identifying the needs of people, taking them to researchers at land-grant institutions, and offering solutions in the form of educational programs grounded in research.

There is criticism from some quarters that Extension has outlived its usefulness and is not relevant anymore (McDowell, 2004; 2001; Warner, Christensen, Dillman, & Salant, 1996). But, Extension still exists and continues to serve the public (Holz-Clause, 2009; Warner et al.). Holz-Clause stated that “Extension’s brand equity in the knowledge market is about the quality of its applied research and the quality of its educators” (p.118), reflecting the credibility of the CES.

There are many food safety education providers in the United States. But, the CES is the primary facilitator of information for clients in the food, fiber, and energy production

chain (Holz-clause, 2009). The CES is “considered the most reliable and unbiased source of information...” (Feller et al, 1984, p.65 as cited by McDowell, 2001) because the education offered is grounded in research conducted at the land-grant universities (McDowell, 2001). Association of Public and Land-Grant Universities (2009) stated that research conducted at land-grant universities is translated into pragmatic knowledge and disseminated to the public through the CES.

The CES has grown enormously since its inception. CES is a dynamic and ever-changing organization (Seevers et al., 1997). Initially its emphasis was on agriculture and home economics which later evolved into different program areas covering almost all the facets related to human living. The changes that have occurred in the CES over the years have expanded it mainly into seven program areas (Iowa State University Extension, 2010):

1. Extension to agriculture and natural resources,
2. Extension to business and industry,
3. Extension to community and economic development,
4. Extension to Families,
5. Extension to 4-H youth development,
6. Continuing education and professional development, and
7. Global Extension

The program areas differ from state to state depending on the needs of the community.

The CES is the largest adult education institution in America (Franz, 2007). A great majority of its clients are adults, the only exception being 4-H and Youth development that is completely dedicated to serving young people. Therefore, the CES should ground its organizational operations in adult education theories (Franz). Given this interrelatedness and

the fact that extension educators who participated in this study were adult educators, a review of some of the important components of adult education is essential, which is provided in the next section.

Adult Education

Brief history and assumptions about adult education. Adult education in the U.S. dates back to four centuries when the white man landed on the North American coast at Jamestown and Plymouth in 1607 and 1620, respectively (Cartwright, 1945). Adult education occupies a very important place in the American education system. De Crow (1968) stated that “No day passes in the United States without the invention of new kinds of adult education programmes...” (p.186), indicating the importance given to adult learners in the United States education system. According to Long (2004) the increasing number of adult learners in the United States has significant implications in areas like “...economic development, occupational trends, governmental policy, and educational programs and practice” (p.23). Adult education as a professional field of practice in the United States is relatively young, and was founded no earlier than 1920 (Merriam, 2001). Adult education has changed a lot from being highly informal then to being nonformal and formal now.

Previously, it was thought that the principles that hold good for pedagogy would hold good for adult learners, also. It took some thought and time for educators to realize that “...adult is not merely a large child” (Newton, 1977, p.361). Hence, a different approach is needed to educate adults. Various scholars have been working to arrive at a theory or framework that can explain all the facets related to adult learning (Merriam, 2001) but there is no single theory or framework that has been commonly accepted.

Efforts to integrate different ideas and research findings related to adult learning to develop a framework began in 1949. The European scholars had already coined the term ‘andragogy’ for an integrated framework of adult learning to differentiate it from pedagogy (Knowles, Holston, & Swanson, 2005). Alexander Kapp, a German high school teacher coined the term ‘andragogy’ way back in 1833 (Cooper & Henschke, 2001; Reischmann, 2004). Lindemann was the first person to bring this term to the U.S. but it was introduced into American and international literature by Malcolm Knowles (Henschke & Cooper, n.d.). Knowles (1980) defined andragogy as “the art and science of teaching adults” (Knowles, 1980, p.43 as cited by Merriam 2001). Of the different frameworks on adult learning/education, andragogy is one of the commonly accepted frameworks (Merriam, 2001) though it is not sans criticism from some quarters that is not a scientific theory (Davenport, 1987 & Davenport & Davenport, 1985).

Several adult education researchers (Draves, 1997; Kidd, 1973; Knowles, 1984, 1990; Lindeman, 1926 as cited by Knowles (1990); Long, 2002 as cited in Galbraith, 2004; Newton, 1977) have proposed some assumptions about adult learning/education which were theoretically grounded later. The essence of all these assumptions is more or less the same, and can be distilled down to the following 10 assumptions:

1. Adult learning is needs and interests based.
2. Adult’s orientation to learning is life-centered.
3. Adult learner is a storehouse of experiences that determine his identity.
4. Adult learning is self-directed.
5. Adults are characterized by readiness to learn.
6. Adult learning is more variable because of varied ages of the learners.

7. Adult orientation to learning is life-centered or task-centered or problem-centered.
8. Adults are more motivated intrinsically than extrinsically.
9. Adults are neither super learners nor slow learners, and their learning is facilitated in a unique and subjective way.
10. Adult learners are capable of making their own decisions related to their learning.

These assumptions can be applied in various adult learning, professional development, and human resource development settings. The extension educators should consider these assumptions while conducting educational programs because they are time tested and research based. And, the same set of assumptions could be used in designing food safety inservice workshops of extension educators.

Adult education philosophies. Adult education is not highly structured, and educators determine the curriculum for the programs (Zinn, 2004). This involves decision making on the part of adult educator (Zinn). Personal philosophy helps make these decisions which in turn are based on the adult educators' personal beliefs, values, and attitudes (Zinn). Apps (1985) suggested that extension educators can benefit from knowing about their philosophy in five major ways. They can:

1. Become aware of what they do as practitioners,
2. Find alternative approaches to program planning, teaching, budgeting, etc
3. Become aware of how values, ethics, and esthetics can be applied to their practice,
4. Know the importance of personal histories and how they influence what they do as educators, and
5. Free themselves from dependence on someone else's doctrine.

Elias and Merriam (1980) proposed five adult education philosophies: liberal, progressive, behaviorist, humanist, and radical. Liberal philosophy emphasizes content mastery with the educator viewed as expert, whereas the progressive philosophy emphasizes more of experiential education (White & Brockett, 1987). The behaviorist philosophy stresses the role of environment in achieving the desired results, while the humanist philosophy emphasizes the personal growth and self-direction of the learners (White & Brockett). Lastly, the radical philosophy stresses the role of education in bringing about revolutionary social changes, and overcome oppression (White & Brockett). It can be seen that the above stated adult education assumptions are heavily inspired by the humanist philosophy. However, all these philosophies can be used by extension educators based on the situation (White & Brockett).

Transactional modes of adult education. Adult education programs can be organized in a variety of settings and transactional modes (Boyd & Apps, 1980). Adult education in CES falls under nonformal settings. Boyd and Apps classified these varied settings into three transactional modes: individual, group, and community. They cautioned not to mistake transactional modes with teaching methods. The same teaching methods can be used in all three transactional modes. “Individual transactional mode refers to a situation in which an adult learns by himself...” (Boyd & Apps, p.6), whereas, in group transactional mode “...persons meet together...to work on some problem or concern they have” (p.6). In case of community transactional mode a “group of citizens gathers together to resolve a problem their community faces...” (Boyd & Apps, p.6). Different teaching methods and tools can be used to facilitate adult learning in each of these transactional modes. A review of different extension teaching methods and tools is given in the following section.

Teaching methods and tools. According to Cole (1981), the primary role of extension agents is teaching, and for teaching to be effective proper methods and tools have to be selected. Reddy (1993) defined teaching methods as “the devices used to create situations in which communication can take place between the instructor and the learner” (p.31). This definition indicates the importance of proper selection of teaching methods in delivering extension educational programs. As stated previously, numerous methods can be used in teaching adults (Conti & Kolody, 2004). But, they should be selected based on the learning situation, the audiences, subject matter, desired change, learning theories, primary function of method, need and time factors, and availability of the method (Cole). Teaching methods also have an indirect influence in spreading the information in addition to the conscious dissemination that takes place, and this indirect influence is substantial (Reddy, 1993).

Conti and Kolody (2004) stated that the first task to be done before selecting a particular teaching method is defining exactly what we want to accomplish. The method to be selected is very important for it “identifies the ways in which people are organized in an educational activity ...” (Verner, 1959 as cited by Conti & Kolody, p.181). Also, it “...establishes a relationship between the learner and the agency providing the educational activity” (Verner as cited by Conti & Kolody, p.181). Jayaratne and Martin (2003) suggested that extension professionals should learn more about the teaching methods and tools they use if they want to present the information effectively to the clients. In short, the teaching methods used in an educational program determine its impact on clients.

Garton (1999) classified teaching methods into three major categories:

1. One-way communication methods

2. Two-way communication methods
3. Laboratory methods

Lectures, using resource persons, symposiums and panel discussions fall under one-way communication methods whereas group discussion, case study, problem solving, role-play and brain storming fall under two-way communication methods. Demonstrations and tours or field trips fall under laboratory methods. The two-way and laboratory methods provide for experiential education as they give the learner an opportunity to actively engage in the learning situation and reflect on the situation (Garton).

Wilson and Gallup (as cited by Reddy, 1993) classified extension teaching methods based on use and form. This classification is followed in the United States and is given below.

1. Teaching methods according to use: individual contacts, group contacts, and mass contacts
2. Teaching methods according to form: written, spoken, visual or objective and spoken and visual

Telephone calls, office calls and result demonstrations are classified as individual contacts whereas method demonstrations and tours are considered under group contacts. Bulletins, posters, television and exhibits are classified mass contact and written methods. Office calls and telephone calls are considered as spoken methods whereas result demonstrations, exhibits, posters, and motion pictures are considered visual or objective methods. Meetings at methods demonstrations and result demonstrations are classified as spoken and visual methods (Reddy).

Research shows the use of multiple teaching methods in conducting educational programs to be effective, and this should be done based on the situation. According to Hall, McKinnon, Greiner and Whittier (2004) use of multiple teaching methods may be useful when highly technical information is to be presented. They also stated that using multiple methods may be useful for geographically dispersed rural audiences. Rodewald (2001), and Ota, DiCarlo, Burts, Laird, and Gioe (2006) concur that multiple delivery systems are needed to have greater impact on the clients. Garton (1999) supported this view and stated that one of the ways of adding variability to adult education is by using multiple teaching methods. Therefore, extension educators should use multiple teaching methods. Given below is a review of specific functions some of the commonly used teaching methods and aids serve.

According to Israel and Ingram (1991) a relationship of trust can be nurtured with new clientele by using methods such as individual consultation, meetings, and demonstrations. Hall, McKinnon, Greiner and Whittier (2004) stated that workshops facilitate skill building by engaging participants in activities, and along with demonstrations are found to be effective in technology transfer. They further stated that teaching methods should focus on providing experiential learning opportunities to clients, and should be complemented with written reference materials. In his study, Ford (1995) found that farmers preferred farm visits, county meetings and office conferences as the most effective teaching methods. Furthermore, he found that farmers felt that extension agents place more emphasis on individualized methods in helping farmers solve their problems. Studying a similar kind of clientele, Reisenberg and Gor (1989) found that farmers preferred on-farm demonstrations on innovative farming practices.

Coming to the extension educators' preferences regarding the teaching methods and tools, Kwaw-Mensah (2008) found that extension educators perceived one-on-one instruction and demonstrations to be effective in educating farmers about livestock waste management. Camara (2006) found similar results researching extension educators' perceptions regarding the teaching learning processes about water quality issues (Camara, 2006). In a related study, Jayaratne and Martin (2003) found that extension educators perceived one-on-one instruction and demonstrations to be effective teaching methods in educating farmers about sustainable agriculture practices.

Chizari, Karbasioun and Lindner (1998) found that the extension agents perceived result demonstrations, method demonstrations and formal group meetings to be the most effective teaching methods. Hall, McKinnon, Greiner and Whittier (2004) found that learners preferred experiential learning methods and concise printed materials over seminars. Furthermore, they found that, printed fact sheets and bulletins were among the most preferred sources of information for the extension agents as well as their clientele.

Teaching tools play an important role in supplementing the information presented by extension educators. Marrotte (2000) found that learners preferred LCD projectors and PowerPoint® presentations because they felt they could concentrate on the presentation and not worry about taking down notes. According to Rodewald (2001) face-videos and seminars are less preferred information sources. Lehtola (2007) stated that table-top simulations are useful when hands-on training is not possible because they give a chance to debate appropriate choices and decisions rather than encountering them for the first time in real-life. Dale (1969) supported that simulations are useful when real experiences are not possible.

Jenkins, Newman, Castellaw, and Lane (2000) found that cattle tips given on check stubs were effective in directing learners' attention to specific management practices. They also suggested that telephone calls were an effective way of getting answers from extension personnel. Furthermore, they found that circulars and newsletters were effective in reaching people. According to Kaiser, McMurdo and Joy (2007) poster sessions and small round table conferences can facilitate problem-solving skills in learners.

Elliott (1999), and Steimle and Duncan (2004) stated that World Wide Web or internet can be effectively used in disseminating information to clients. Xie and Gu (2007) indicated the utility of podcasts in advancing Extension. Smith and Davis (2008) concur that podcasting along with radio broadcasting, and internet was successful in reaching out to thousands of clients. Podcasts are one of the most commonly used delivery tools by University Extension to convey important information (for example Iowa State University Extension). In addition to the internet and podcasts, videos are also effective tools that can be used by extension educators in their educational programs. Day, Latham, and Leigh (2004) found that video can be successfully used with American audiences, and along with television can be used in educating large groups of people. Barkman (1991); Israel and Ingram (1991); and Polson (1999) also supported the utility of videos in educating people. Barkman found that inserting questions into the video programs facilitates effective learning.

In short, the above cited literature suggests that a variety of teaching methods and tools can be used by extension educators in educating clients. In addition to selecting proper teaching methods, extension educators should be competent in the educational processes required in conducting successful educational programs.

Educational Processes and Inservice Education

Educational processes have been identified as one of the competency areas for the effectiveness of extension agents (Brown, Gibson, & Stewart, 2008; National Policy Statement on Staff Training and Development, 1968 as cited by Gibson & Hillison, 1994). The Iowa State University Extension has identified educational programming, education delivery, program prioritization, planning etc as core competencies for extension professionals around the world (ISU Extension, 2009). The framework for research in adult education developed by The North Central Region-158 Committee on Adult Education in Agriculture identified competencies related to needs assessment, learning systems, delivery systems and evaluation systems as essential components in adult educational processes in agriculture (NCR-158 Committee on Adult Education in Agriculture, 1990).

Extension educators are concerned about assessing the needs of their clients (Etling, 1995), and conduct such assessments on a regular basis (Malmshemer & Germain, 2002). Needs assessment is one of the components of the extension program planning process (Caffarella, 2002; Etling, 1995; Reddy, 1993). One of the first priorities for a new extension educator is conducting a needs assessment of clients he/she is going to serve (Caravella, 2006). A systematically conducted needs assessment is not only beneficial to the extension educator who conducts it, but also to others working with similar clients (Caravella). Needs can be assessed in various ways.

Etling (1995) classified needs assessment methods into two categories: office techniques and group techniques. Resource inventory forms, review of file records, future projection wheels, and reflective listening while attending office/telephone calls are some of the office techniques an extension educator can use, whereas nominal group process, county

form, focus group interview, and brainstorming are classified as group techniques (Etling; Seevers, et al., 1997). Extension educators can also use social indicators like demographic information in order to assess needs (Etling). Program evaluation can also be used as a needs assessment technique but has its limitations, and hence should be used in combination with other needs assessment methods (Etling). Caravella (2006) stated that census review, review of existing needs assessment surveys, and key informant interviews can be used to identify needs from both quantitative and qualitative sources.

Once the needs of the clients are assessed, extension educators design the learning situation. Adults have diverse learning styles (Idding & Apps, 1992; Johnson, Carter, and Kaufman, 2008; Place, 2007), and for effective instruction to take place educators should be competent in working with different kinds of learners (Papalla, 1976). A learning style is the way information is perceived, processed, and retained by an individual (Johnson, et al.). Adults learn best when teaching methods complement their learning styles (Rollins & Scholl, 1992). Hoover and Connor (2001) supported this view that accommodating the learning styles of all learners ensures successful transfer of information in extension programs. Johnson et al., stated that diverse learning styles of learners affect the program delivery in CES. Therefore, extension educators should use teaching methods that appeal to all the senses of learners (Place, 2007). Furthermore, designing extension programs keeping learning styles of learners in view was identified as one of the important principles for conducting effective extension work (Place).

There are different instruments for measuring learning styles. *Myers-Briggs Type Indicator*[™] (MBTI) and Witkin's *Group Embedded Figures Test*[™] (GEFT) are the two most widely studied learning style and personality type models in agricultural education

research (Davis, 2006). A couple other models that have been used in agricultural education research are *Mind Styles*TM Model (Gregorc, 2005) and *Personal Style Inventory*TM (PSI) (Davis). These models classify learners into distinct categories with each category having unique learning preferences. Johnson et al., (2008) found that the learning styles of farmers (learners) and information providers were completely different. Such a mismatch will not lead to successful learning. Extension educators should be knowledgeable about such learning models so they can make all learners participate equally in their programs.

Once decisions regarding learning have been made extension educators need to take care of the delivery systems. The different teaching methods and tools that are used for conducting educational programs fall under the category of delivery systems. A review of the different teaching methods and tools was already given under the ‘Adult Education’ section in this chapter. In addition to the learning and delivery systems it is also important for extension educators to be knowledgeable in evaluation systems.

Extension educators can no longer assume that the usefulness of their programs is self-evident (Andrews, 1983; Rennekamp & Arnold, 2009). Evaluating extension programs is essential for accountability purposes (Andrews; Jayaratne, Hanula, & Crawley, 2005; Kelsey, Schnelle, & Bolin, 2005; Smith & Lincoln, 1984). CES has a wide range of stakeholders all of whom are interested in knowing the impact of extension programs, and in this context effective evaluation systems are critical for success (Braverman & Engle, 2009).

According to Seevers et al., (1997) evaluations fit into two types: formative and summative. Formative evaluations are done to improve the program whereas summative evaluations are taken up to assess the impact for accountability purposes (Fitzpatrick, Sanders and Worthen, 2004; Schuh, 1996; Seevers et al.). Several evaluation approaches

and models are used in agricultural education settings. Fitzpatrick et al., (2004) categorized these approaches into five primary categories viz., objectives-oriented, management-oriented, consumer-oriented, expertise-oriented, and participant-oriented approaches. These approaches are value neutral and have to be chosen based on the purpose. Some of the methods that can be used for collecting evaluation information are analyzing existing records, surveys, nominal group process, focus groups, concept mapping, card sorts, observations, public hearings, and interviews (Seevers et al.,; Smith & Lincoln, 1984).

It is evident from the literature cited above that extension educators need to be competent in the identified educational processes: needs assessment, program planning, learning systems, delivery systems and evaluation systems. But, the point of research interest is how competent are they and what are their inservice needs related to these educational processes? Research findings that indicate the need for inservice education to extension educators on these five educational processes are presented in the next section.

Inservice Education Relative to the Identified Educational Processes

Extension professionals are expected to participate in professional development activities (Miller & Miller, 2009), and are in constant need of training (Taylor & Curtis, 1999). Schunk (2008) stated that “There is no substitute for strong professional development ...” (p.273). Professional development will help extension professionals to excel in their jobs and meet the high standards they have set for themselves (Stone & Coppernoll, 2004). Stone and Coppernoll further stated that professional development will help Extension make local, national, and global impact. Conklin, Hook, Kelbaugh, and Nieto (2002) stated that inservice education is one of the important components of professional development, and is

one of the ways of improving programs (Christensen, Warnick, Spielmaker, Tarpley, & Straquadine, 2006).

Many extension professionals around the world are not adequately trained in adult learning processes, evaluation, program structuring and organizing and communication processes (ISU Extension, 2009). Gibson and Hillison (1994) found that extension administrators, agents and specialists perceived competence in program planning and educational processes to be important for delivering successful educational programs. Further, the administrators felt that extension agents needed inservice training in the educational processes relative to conducting an educational program. In another research study, Radhakrishna (2001) found that state extension specialists needed inservice education in conducting needs assessment.

Many extension educators don't evaluate their programs meaningfully (West, 2007), and one of the reasons for this is lack of expertise in evaluation methodologies (Chapman-Novakofski, et al., 1997). Gibson and Hillison (1994) found that extension agents were in need of inservice training in implementing evaluation procedures. Bailey and Deen (2002); and Jayaratne, Lyons, and Palmer (2008) concur that many extension professionals have little background in evaluation. Therefore, it is important to address these concerns through inservice education.

Program development and evaluation were identified by the You, Extension and Success! (YES), a competency-based professional development framework developed by the Texas Extension Service as the required competencies for extension professionals (Stone & Coppennoll, 2004). Extension agents of Clemson University Extension expressed a greater need for inservice training in specific areas of program evaluation (Radhakrishna & Martin,

1999). It is evident from the above cited research studies that extension professionals are in need of inservice education relative to educational processes required for conducting educational programs.

Previous Related Studies

Analyzing the perceptions of people involved with agriculture and their use of educational processes is important to making decisions. This is reflected in the number of research studies that have been conducted nationally and globally in agricultural and extension education in these areas on major agricultural issues like livestock waste management (Kwaw-Mensah, 2008), water quality issues (Camara, 2006), sustainable agriculture (Jayaratne, 2001), ecological paradigms (Connors, Swan, & Brousseau, 2004) and soil and water conservation issues (Bruening & Martin, 1992), and on topics like curriculum development (Layfield, Minor, & Waldvogel, 2001), inservice education (Chizari, Lindner, & Zoghie, 1999; Koundinya & Martin (in press); Layfield & Dobbins (2002)), educational delivery strategies (Dollisso & Martin, 2001; Toro & Place, 2004). A brief summary of research findings from each of these studies is given below.

Kwaw-Mensah (2008), Camara (2006) and Jayaratne (2001) analyzed the perceptions of extension educators of the NCR of the U.S. regarding educational processes used in teaching livestock waste management, water quality issues, and sustainable agriculture, respectively. Kwaw-Mensah found that extension educators perceived livestock waste management concepts and practices and livestock waste management education favorably. But, their perceptions regarding the extent of use of selected teaching methods and tools, and their effectiveness were not as favorable.

Camara (2006) found that extension educators perceived protecting water and environment to be an important concern. Jayaratne (2001) found that extension educators perceived sustainable agriculture favorably and felt that sustainable agriculture practices were beneficial. However, 43.2% of these respondents perceived the term 'sustainable agriculture' to be ambiguous. Based on these findings they made some important recommendations to improve the extension educational processes. Connors, Swan, and Brousseau (2004) explored the perceptions of agriculture teachers of Lithuania towards the ecological paradigm. The agriculture teachers perceived environmental sustainability and social responsibility to be very important to the future of Lithuanian agriculture, and hence taught these topics to to students, indicating the influence of perceptions on actions.

Chizari, Lindner, and Zoghie (1999) studied the perceived educational needs of Iranian extension agents on sustainable agriculture, and found that extension agents needed training to effectively disseminate sustainable agriculture practices. Also, they perceived visits to countries with advanced sustainable agriculture practices and educational programs during winter months as effective ways of receiving education on sustainable agriculture.

Layfield and Dobbins (2002) identified the inservice needs of South Carolina agriculture teachers based on their perceived competence in teaching related factors. They found that using computers in classroom teaching was the major need for experienced teachers whereas utilizing a local advisory committee was the major need for beginning teachers. Developing a local adult education program was the common major need for both sets of teachers. Important recommendations for addressing these needs were made based as a result of this research study. Koundinya and Martin (in press) studied the food safety

inservice needs of agriculture teachers in Iowa and suggested that their perceptions about food safety issues could influence their behavior related to inservice education.

Layfield, Minor, and Waldvogel (2001) determined the perceptions of South Carolina agriculture teachers toward integration of science into the agricultural education curriculum and found that the teachers perceived themselves to be prepared to teach biological and physical science concepts. They also perceived that undergraduate instruction in agricultural education should teach about integration concepts. Dollisso and Martin (2001) analyzed the perceptions of farmers of the Iowa Young Farmers Educational Association regarding their preferred sources for receiving educational information and found that these farmers preferred magazines more than anything else.

Jayaratne, Martin, and DeWitt (2001) studied the perceptions of extension educators in the Agricultural and Natural Resources program area in the NCR of the U.S. and found that extension educators perceived sustainable agriculture positively. The extension educators perceived practices like integrated pest management to be more an educational process than mere delivery of information. Toro and Place (2004) studied the perceptions of Honduran dairy farmers towards an extension educational delivery system and found that farmers perceived that local extension programs were not based on their needs. Regarding the educational delivery methods they preferred programs involving hands-on activities. Bruening and Martin (1992) studied the perceptions of the farmers regarding soil and water conservation issues and found that farmers perceived the Conservation Reserve Program to be beneficial.

It can be seen from the above cited research studies that perceptions of respondents were analyzed in making important decisions for improving the educational processes and

programs. Also, it can be reasonably deduced from these research findings that perceptions are the perceivers' reality about the world and important decisions for their improvement are made based on what they perceive.

Summary

This chapter was organized under the sections: U.S. and global food safety situation, theoretical and conceptual framework, the characteristics and usefulness of perceptions, reviews on CES, adult education, educational processes and need for inservice education, and research findings from related past studies.

The Theory of Planned Behavior provided the theoretical framework for this study. The main premise of this theory is that a person's intentions to perform a behavior and the actual behavior can be predicted by some factors, with perceptions about behavioral control being one of the most important factor. This tenet was conceptualized to infer that extension educators' perceptions about food safety and the educational processes related to food safety education, and inservice needs related to food safety education could influence their behavior related to educational delivery systems (teaching methods and tools) and inservice education.

Since the perceptions of extension educators were analyzed in this study, a review of the characteristics and usefulness of perceptions was provided. The literature indicated that perceptions result in awareness, judgments, and knowledge about the object being perceived. Also, perceptions would help understand the perceiver's world-views and experiences. The literature also indicated that higher order cognitive skills are utilized while processing the perceived information indicating that perceptions are meaningful to the perceiver and are not the result of some random actions.

This study was confined to extension educators in the program areas of agricultural and natural resources, family and consumer sciences, and all the county extension directors working in the CES. Food safety education is one of the important educational topics CES offers. A review of history, importance and functions of CES was provided to give context to the study and justify the selection of extension educators as research subjects for this study from among the different food safety educators in the U.S.

The primary clients for the research subjects of this study are adults. Therefore, a review of different adult education philosophies, theories, and different teaching methods and tools used in extension educational programs was presented. Extension educators have to do a lot of ground work before conducting educational programs. They have to assess the needs of their clients, plan the programs, make decisions related to learning systems, delivery systems, and have to evaluate the programs for accountability and impact assessment purposes. So, a review of the importance of these five identified educational processes in conducting food safety educational programs, and the inservice needs of extension educators relative to these processes was given. The literature review suggested that extension educators may not yet be fully competent in these five educational processes.

Finally, a review of research studies that have been conducted on analyzing the perceptions of agricultural educators about some important agricultural issues; identifying the various educational strategies used by extension educators; and identifying the inservice needs of agricultural educators was given. This section encompassed research studies from different countries in both formal and non-formal agricultural education settings indicating the importance and global applicability of this study.

In conclusion, this chapter has provided a rationale for this study and provides the foundation for answering the following research questions:

1. What are the perceptions of extension educators toward food safety?
2. What are the perceptions of extension educators toward the educational processes related to food safety education?
3. What food safety educational processes related inservice needs do extension educators have?
4. What are the perceptions of extension educators regarding the effectiveness of different teaching methods and tools for food safety education?
5. To what extent are extension educators using different teaching methods and tools in food safety education?

CHAPTER 3

Methods

The purpose of this study was to analyze the perceptions and extent of use of food safety educational processes by extension educators in the Cooperative Extension System of the North Central Region of the United States. The following five specific objectives served to accomplish the study's purpose:

To identify and analyze:

1. The perceptions of extension educators toward food safety;
2. The perceptions of extension educators toward the educational processes related to food safety education;
3. The food safety educational processes related inservice needs of extension educators.
4. The perceptions of extension educators regarding the effectiveness of different teaching methods and tools for food safety education; and
5. The extent of use of the different teaching methods and tools by extension educators in food safety education.

This chapter provides a description of the research design, methods and procedures used towards accomplishing the purposes of the study. The chapter was organized under the sections: research design, data source, sampling procedure, instrumentation, data collection, data analysis, assumptions made by the researcher and limitations of the study.

Research Design

A descriptive cross-sectional survey was used for this study. This survey included measuring both intangibles (perceptions) and tangibles (teaching methods and tools, and inservice needs). The intangible measure was operationally defined to facilitate objective

data collection and analysis. This research design was deemed appropriate for this study because this study was predominantly exploratory and descriptive, and aimed at collecting information from a large sample. According to Ary, Jacobs, Razavieh, and Sorensen (2006), a survey design is appropriate when collecting information from a large sample. Since it is a survey, some internal validity threats are inherent which were addressed by using a suitable, reliable and valid questionnaire. Measurement error was reduced by stating the questions clearly without any ambiguity and giving short and simple instructions for each section.

External validity threats like sampling error, selection error, and frame error were addressed by selecting an up-to-date representative random sample free of duplications. However, non-response error could be a threat to the external validity of this study. Therefore, proper statistical measures grounded in research were adopted to account for this error. Overall, the research design chosen for the study was believed to be appropriate to accomplish the purpose of this study.

Data Source

The population for this study consisted of all extension educators in the program areas of Family and Consumer Sciences and Agriculture and Natural Resources, and the County Extension Directors (CEDs) in the NCR of the U.S. CEDs were selected because most of them had job responsibilities in more than one program area. The sampling frame was prepared by procuring the list of Family and Consumer Sciences and Agricultural and Natural Resources extension educators and CEDs from the most current staff directories at respective land-grant university CES websites. The list thus procured was cross-checked for accuracy with the list of extension educators procured by another researcher who had the

same survey population. The frame was duly double checked for any possible duplication. These procedures ensured that there were no selection and frame errors.

Sampling Procedure

The probability sampling procedure was used and a disproportional stratified random sample was drawn from the total population. A margin of error of $\pm 5\%$ at 95% confidence level with a 0.5 variance of hypothesized proportion was considered for this study. The sample size was calculated using the formula:

$$n = \left[\frac{1}{\frac{E}{\sqrt{pq}}} \right]^2 (z)^2$$

Where

n = sample size needed

E = desired margin of error

pq = variance of hypothesized proportion

z = z score of confidence interval

The formula yielded a sample size of 384 research subjects for the above mentioned chosen criteria. Ary et al., (2006) suggested oversampling the subjects based on the anticipated response rate for the study, and indicated a response rate of 50% to be achievable for social science studies. Baruch (1999) analyzed 175 different academic studies in the years 1975, 1985, and 1995, covering about 200,000 respondents, and found the mean response rate to be 55.6%. Along the same line, the researcher analyzed all the articles ($n=22$) published in the *Journal of Agricultural Education*, the premier peer-reviewed journal

in the agricultural education discipline in the U.S., in the year 2008, and found the mean response rate to be 71.85%. The response rate achieved for the pilot-test conducted for this study with 20 randomly selected extension educators was 40%. Keeping the mean response rate (55.81%) of these three findings and suggestions of Ary et al. in view, a 50% response rate was anticipated for this study, and accordingly the sample was oversampled by 100%. So, 768 extension educators served as the sample for this study. Some of the email messages bounced back due to invalid email addresses while some potential respondents had opted out of surveys via SurveyMonkey[®]. Replacement lists were developed and administered duly following the sampling procedure. The researcher made sure that 768 extension educators received the surveys.

Sixty-four extension educators were randomly selected from each of the 12 strata (states). Ary et al (2006) indicated this to be an appropriate sampling method for researching the differences among the strata. Agresti and Finlay (2008) stated that disproportional stratified sampling is useful when there are differences in the population sizes among the different strata. This was true for this study as there were differences in the population sizes among the different states with Wisconsin having as high as 378 and South Dakota having as few as 89 eligible research subjects. So, the sampling procedure selected for this study was deemed appropriate.

Instrumentation

The Institutional Review Board at the Iowa State University approved this study. The electronic questionnaire was developed using SurveyMonkey[®] with the cooperation of the Director of the Brenton Center of Technology and Instruction, College of Agriculture and Life Sciences at the Iowa State University. The questionnaire was modeled on the

questionnaires used by Creswell (1990), Jayaratne (2001), Kwaw-Mensah (2008), and Walczyk and Ramsey (2003). The questionnaire consisted of seven sections. Sections I, II, III, IV and V used five point Likert-type scales, and Sections VI and VII used open-ended and close-ended questions. A five point continuum was used for the Likert-type scales with a view of giving provision for extension educators to take a neutral stance, if they wished.

There were 9, 8, 5, 12, and 14 items in sections I, II, III, IV, and V, respectively. Four negative statements (items 3, 6, 7, and 8) were included in section 1 (perceptions about food safety) to identify any response set bias. For measuring the perceptions about food safety (section 1), the scale used was from 1 = Strongly Disagree (SD) to 5 = Strongly Agree (SA). For measuring the perceived importance and the extent of use of the educational processes (section 2), the scale used was from 0 = Not Important (NI) to 4 = Highly Important (HI), and 0 = Not Used (NU) to 4 = Always Used (AU), respectively. For measuring the perceived inservice needs for the educational processes (section 3), the scale used was from 0 = None (N) to 4 = Very High Need (VHN). For measuring the perceived effectiveness and the extent of use of different teaching methods (section 4) and teaching tools (section 5), the scale used was from 0 = Not Effective (NE) to 4 = Very Effective (VE) and 0 = Not Used (NU) to 4 = Always Used (AU), respectively. The scale started with 0 for sections 2 through 5 because 0 meant absence of the variable being measured.

The questionnaire was reviewed by an expert validation panel for face, content and construct validity. The expert panel consisted of professors from the Departments of Agricultural Education and Studies, Food Science and Human Nutrition, and some program leaders in ISU Extension. The experts determined whether or not the questions were properly framed, did they measure what they purported to measure and whether or not the

perception statements were clearly worded to elicit proper responses. All of the suggestions made by the panel were given due consideration.

The questionnaire was pilot-tested with 20 randomly selected extension educators, and the data were used to establish the reliability of the questionnaire. A sample size of 20 for a pilot-test is appropriate to discover any major flaws in the questionnaire that could affect the main study (Sudman, 1976). The extension educators that participated in the pilot-test were excluded from the population to prevent a contaminated sample. For reliability of the questionnaire, Cronbach's α was computed from the data collected in the pilot test. Values of 0.729, 0.905, 0.952, 0.768, and 0.893 were reported for sections 1 (perceptions about food safety), 2 (perceived importance and the extent of use of the identified educational processes), 3 (perceived inservice needs regarding the identified educational processes), 4 (perceived effectiveness and the extent of use various teaching methods), and 5 (perceived effectiveness and the extent of use various teaching tools), respectively. George and Mallery (2003) gave the following rule of thumb while interpreting the α values: $> .9$ – excellent, > 0.8 – good, > 0.7 – acceptable, > 0.6 – questionable, > 0.5 – poor, and < 0.5 – unacceptable. So, the questionnaire used for this study was considered reliable.

Data Collection

The extension educators were emailed a letter informing them the purpose of the research. This letter sought their cooperation, and it was made clear that their participation in this study was completely voluntary and they could withdraw at any time they wished. It was also ensured that any changes in the study's objectives would be shared with them. After that, the questionnaire was emailed to them and a total of four follow-ups (Dillman, 2007) were conducted at suitable time intervals. Their consent for the study was assumed if

they filled out the questionnaire. No monetary incentive was offered for participating in the study. A log of important events was maintained all through the research process.

Dillman (2007) suggested that the final contact should be made differently than the other contacts. He suggested using a telephone call or some other form of special delivery as the final contact. Dillman, Smyth, and Christian (2009) suggested to vary the stimulus across the email follow-ups to attract research participants and also to avoid the messages getting sorted out by spam filters. Accordingly, the researcher used different subject lines with the last follow-up email which proved effective in improving the response rate. Also, Dillman et al., indicated that the time interval between the different follow-ups may be situation based.

Data Analysis

The data were analyzed using SPSS[®] version 17.0. Both descriptive and inferential statistics were used in data analysis. All the data collected via Survey Monkey[®] were deleted once analysis was done and the results were published. It was made sure that only the researcher had access to the data. The demographic information was used only as group data. These processes ensured anonymity and confidentiality to the research participants.

Descriptive statistical parameters like sample mean (M), standard deviation (SD), percentages (%) were used for analyzing the perceptions of extension educators and the demographic information. Inferential statistical tools like independent samples t -test, paired samples t -test and one-way $ANOVA$ were used to test for any significant differences between and among the groups, respectively.

Assumptions Made By the Investigator

The following assumptions were made by the researcher before starting this study:

1. The extension educators provided accurate information, and not give socially desirable answers.
2. The extension educators did not interact with each other while filling out the questionnaire.
3. The extension educators understood the questions in the questionnaire the way the researcher intended.
4. There was no response set bias involved while answering the Likert-type items.
5. The staff directories available in the websites were up-to-date.

Limitations/Delimitations of the Study

1. The sampling frame was developed using the staff directories on the respective CES websites. Extension educators not listed in these directories were not represented in the sample.
2. The results from the perceptions component of this study cannot be generalized over a longer period of time as perceptions tend to change with time. Therefore, the findings are applicable only to the period when the data were collected. However, they provide important insights related to the development of improved delivery systems for education in food safety and for designing inservice workshops for extension educators.
3. This study had a response rate of 42.31%. According to Lindner, Murphy and Briers (2001) any response rate of less than 85% could result in significant differences between early and late respondents, thus affecting the external validity of the study. One of the methods for handling nonresponse error (42.31%) is comparing early and

late respondents (Dooley & Lindner, 2003; Miller & Smith, 1983). This limitation was accounted for by comparing early and late respondents using an independent samples *t*-test. Overall, there were no statistically significant differences at the 0.05 level of significance suggesting that the results could be generalized to non-respondents and the total population. So, this limitation was reasonably considered as not being a threat to external validity. For the purpose of this study early respondents were defined operationally as those subjects who responded to the first mailing and the first two follow-ups, and those who responded after that were treated as late respondents.

4. The study population was limited to extension educators in the NCR of the U.S. Therefore, the results may not be generalized to the entire country. NCR was purposively selected because it is the major agricultural production region of the country and as such agricultural operations on the farm affect food safety. Another major consideration in selecting this region was to contribute to the existing knowledge base of a region that provided the researcher with an opportunity to pursue his doctoral education.

CHAPTER 4

Findings

The purpose of this study was to analyze the perceptions and the extent of use of food safety educational processes by extension educators in the Cooperative Extension System of the North Central Region of the United States. The following five specific objectives served to accomplish the study's purpose:

To identify and analyze:

1. The perceptions of extension educators toward food safety;
2. The perceptions of extension educators toward the educational processes related to food safety education;
3. The food safety educational processes related inservice needs of extension educators;
4. The perceptions of extension educators regarding the effectiveness of different teaching methods and tools for food safety education; and
5. The extent of use of the different teaching methods and tools by extension educators in food safety education.

The results from this study were presented under the following sections: demographic information, findings for each objective, and additional comments provided by the respondents for improving food safety education offered by the CES.

Four hundred sixteen of the 768 extension educators contacted (54.16%) responded to the questionnaire. However, only 325 questionnaires were usable, yielding a response rate of 42.31%. An independent samples *t*-test was used to test for any statistically significant differences between early and late respondents. Early and late respondents were compared on the summated mean score for section 1 (perceptions towards food safety), mean scores for

all the items in sections 2 (perceived importance and extent of use of educational processes), 3 (perceived inservice needs), 4 (perceived effectiveness and extent of use of the identified teaching methods), 5 (perceived effectiveness and extent of use of the identified teaching tools), and demographics like age and work experience.

The *t*-test results revealed that there were no statistically significant differences between the two groups at the 0.05 level of significance on all items except the perceived effectiveness of the teaching tools WebCt, interactive whiteboard, posters and charts, and the extent of use of PowerPoint[®], posters and videos. Late respondents had significantly higher mean scores than the early respondents on all the above mentioned items except the extent of use of videos in their food safety educational programs. Therefore, it was decided not to generalize the findings on these items to non-respondents and the total population. The data were analyzed using SPSS[®] version 17.0, and the findings are presented accordingly.

Demographic Information

The respondents had a mean work experience of 14.86 years, with a standard deviation of 10.04. Their work experience ranged from 1-40 years. The mean age of the respondents was 48.62 years with a standard deviation of 10.85 (Table 1). The respondents ranged from 24-73 years of age. Since outliers were detected in the age category, a median was calculated to account for the skewed distribution. The median age of the respondents was 51 years, indicating that the age distribution was negatively skewed. A majority (56.25%) (Figure 1) of the respondents were female, and had earned a master's degree (61.68%) (Figure 2).

Table 1

Mean and standard deviation scores of extension educators based on their work experience and age

Demographic characteristic	<i>M</i>	<i>SD</i>	<i>n</i>
Work Experience	14.86	10.04	289
Age	48.62	10.85	271

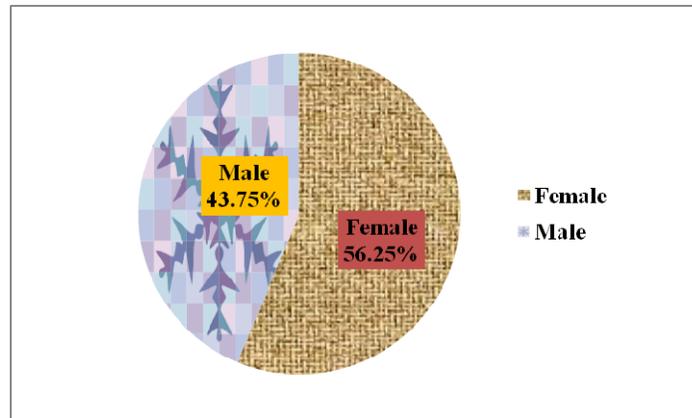


Figure 1. Frequency distribution of extension educators based on their gender (n= 320)

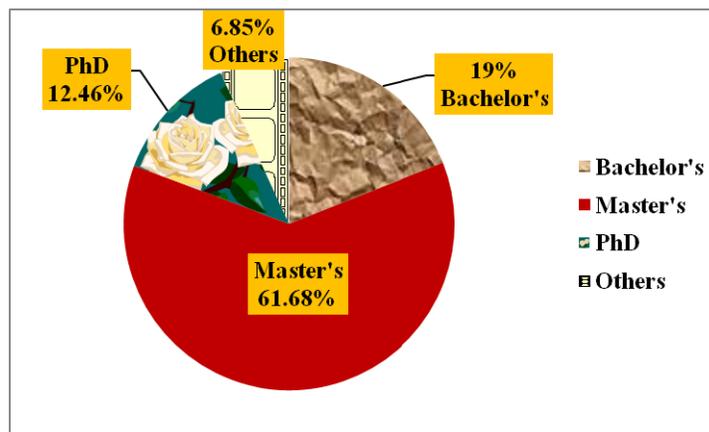


Figure 2. Frequency distribution of extension educators based on their academic degree (n= 321)

Objective 1

Perceptions of extension educators about food safety were calculated using the summated mean score of the nine identified food safety statements. It was defined operationally such that a score of ≤ 2.00 would be considered as a low or negative perception, a score of 2.01-4.00 as neutral, and ≥ 4.01 as high or positive perception about food safety on the five-point Likert-type scale that ranged from 1-5. The respondents had a mean perception score of 3.86, with a standard deviation of 0.40, indicating they had neutral perceptions about food safety. The four negative statements were reverse coded and individual mean scores were calculated accordingly.

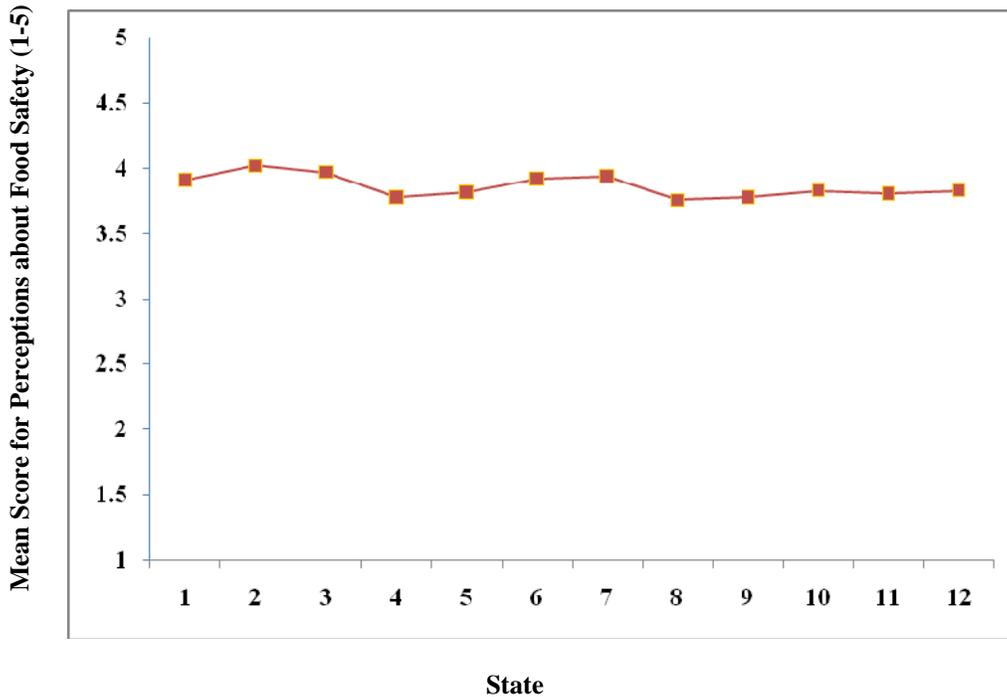
A one-way analysis of variance (*ANOVA*) was computed to test for any statistically significant differences in the mean perception scores of extension educators among the 12 states of the NCR. It was found that there were no statistically significant differences in the mean perception scores of extension educators at the 0.05 level of significance (Table 2). The mean food safety perception scores of extension educators belonging to different states of the NCR are presented in Figure 3.

Table 2

One-way ANOVA among the extension educators of the different states of NCR based on their perceptions about food safety (n=310)

Source of variation	df	SS	MSS	F	P
Between groups	11	1.651	.150	1.253	.251
Within groups	298	35.692	.120		

*P < 0.05



1= Illinois, 2= Iowa, 3= Kansas, 4= Michigan, 5= Indiana, 6= Minnesota, 7= North Dakota, 8= South Dakota, 9= Ohio, 10= Nebraska, 11= Wisconsin, 12= Missouri

Figure 3. Statewise mean scores of extension educators based on their perceptions about food safety

On further analysis, the frequency distribution, mean, and standard deviation scores of the individual food safety statements (Table 3) indicated that only three out of the nine food safety statements: “food safety includes many different aspects from farm to fork”, “improper operations on the farm do not affect food safety”, and “irradiation makes food radioactive” had a majority (>50%) of the respondents on one extreme (Strongly Agree) of the scale. Also, the mean scores of only four statements “food safety includes many different aspects from farm to fork” (M = 4.59, SD = 0.84), “improper operations on the farm do not affect food safety” (M = 4.53, SD = 0.84), “irradiation makes food radioactive” (M = 4.35, SD = 0.89) and “freezing food to prescribed temperatures kills bacteria” (M = 4.11, SD =

0.85) fell under the “Strongly Agree” category which was operationally defined as a high perception category. This explains the moderate perceptions of extension educators about food safety.

However, it was interesting to note that 74% (Table 3) of the respondents perceived the term ‘food safety’ as not being ambiguous to them. This could indicate that extension educators might have a clear focus in designing the subject matter related information while conducting food safety educational programs.

Table 3

Frequency distribution, mean, and standard deviation scores of extension educators based on their perceptions about food safety

Food safety perception statement	<i>f</i>					<i>M</i>	<i>SD</i>	<i>n</i>
	1	2	3	4	5			
Food safety is an ambiguous term to me	120	119	34	45	5	2.05	1.08	323
Food safety includes many different aspects from farm to fork	10	5	0	76	233	4.59	0.84	324
Improper operations on the farm do not affect food safety	8	7	5	88	216	4.53	0.84	324
Pesticide residues affect food safety	24	29	38	139	94	3.77	1.17	324
Irradiation is a technology that ensures food safety	11	35	108	120	48	3.49	0.98	322
Irradiation deteriorates quality of food	5	0	117	121	79	3.83	0.85	322
Irradiation makes food radioactive	6	0	56	71	190	4.35	0.89	323

Freezing foods to prescribed temperatures kills bacteria	8	0	52	144	114	4.11	0.85	318
Most food related problems occur as a result of human error	11	22	33	149	107	3.99	1.00	322

1= Strongly Disagree, 2= Disagree, 3= Uncertain, 4= Agree, 5= Strongly Agree

Objective 2

Mean and standard deviation scores for the perceived importance and extent of use of the eight identified components that constitute the core of the educational processes used in conducting food safety educational programs are presented in Table 4.

Table 4

Mean and standard deviation scores for the perceived importance and extent of use of the identified educational process components

Food safety educational process component	Perceived importance			Extent of use		
	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>
Conducting needs assessment	2.86	0.95	316	1.95	1.07	315
Stating objectives of the program	3.22	0.87	315	2.86	1.02	312
Using a variety of teaching methods	3.50	0.71	311	3.00	0.99	308
Revising content to incorporate recent research	3.53	0.75	316	2.99	0.99	311
Using program evaluation feedback in designing future programs	3.42	0.76	313	2.73	1.02	311
Revising teaching strategies based on research about “how	3.10	0.81	315	2.33	1.00	312

learning occurs”						
Possessing knowledge about how adults learn	3.23	0.82	316	2.58	1.06	313
Involving clients in planning educational programs	2.95	0.83	315	2.09	1.06	311
0= Not important to 4= Highly Important				0= Not Used to 4= Always Used		

The mean scores indicated that extension educators perceived all the components but “conducting needs assessment” and “involving clients in planning educational programs” to be “Important” to “Highly Important”, whereas under the extent of use, only “using a variety of teaching methods” fell under the “Frequently Used” category while all the other components fell under “Somewhat” to “Frequently” used categories. An interesting finding was that the component “conducting needs assessment” was the only educational process component that fell under “Rarely” to “Somewhat” used category.

One-way *ANOVA* was computed to test for any statistically significant differences in the mean scores of perceived importance (Table 5) and the extent of use (Table 6) of the identified educational process components. Since eight variables were compared, a Bonferroni correction factor was applied to the significance level (α) and a value of 0.00625 (apriori set significance level/number of variables= 0.05/8) was set as the significance level. The results from this test indicated that there were no statistically significant differences among the extension educators of 12 states on both perceived importance and extent of use.

Table 5

One-way ANOVA among the states of NCR based on extension educators' perceived importance of the educational process components

Conducting needs assessment	df	SS	MSS	F	P
Between groups	11	17.940	1.631	1.828	0.049
Within groups	304	271.209	0.892		
Stating objectives of the program					
Between groups	11	15.400	1.400	1.902	0.039
Within groups	303	223.045	0.736		
Using a variety of teaching methods					
Between groups	11	6.999	0.636	1.245	0.256
Within groups	299	152.744	0.511		
Revising content to incorporate recent research					
Between groups	11	4.844	0.440	0.762	0.678
Within groups	304	175.773	0.578		
Using program evaluation feedback in designing future programs					
Between groups	11	9.375	0.852	1.483	0.137
Within groups	301	172.957	0.575		
Revising teaching strategies based on research about "how learning occurs"					
Between groups	11	9.242	0.840	1.271	0.240
Within groups	303	200.301	0.661		
Possessing knowledge about how adults learn					
Between groups	11	9.655	0.878	1.298	0.224
Within groups	304	205.20	0.676		
Involving clients in planning educational programs					
Between groups	11	10.291	0.936	1.375	1.84

Within groups	303	206.173	0.980
---------------	-----	---------	-------

*P < 0.00625

Table 6

One-way ANOVA among the states of NCR based on extension educators' extent of use of the educational process components in food safety educational programs

Conducting needs assessment	df	SS	MSS	F	P
Between groups	11	26.592	2.417	2.194	0.015
Within groups	303	333.872	1.102		
Stating objectives of the program					
Between groups	11	17.758	1.614	1.583	0.103
Within groups	300	305.854	1.020		
Using a variety of teaching methods					
Between groups	11	10.890	0.990	1.003	0.443
Within groups	296	292.081	0.987		
Revising content to incorporate recent research					
Between groups	11	17.335	1.576	1.638	0.087
Within groups	299	287.636	0.962		
Using program evaluation feedback in designing future programs					
Between groups	11	7.215	0.656	0.619	0.812
Within groups	299	316.688	1.059		
Revising teaching strategies based on research about "how learning occurs"					
Between groups	11	8.977	0.816	0.798	0.642
Within groups	300	306.686	1.022		
Possessing knowledge about how adults learn					
Between groups	11	17.509	1.592	1.415	0.165
Within groups	301	338.497	1.125		

Involving clients in planning educational programs					
Between groups	11	8.956	0.814	0.711	0.728
Within groups	299	342.523	1.146		

*P < 0.00625

Furthermore, it was observed that the mean scores of perceived importance (Table 4) of all the items were more than the corresponding extent of use items. Hence, a paired *t*-test was computed to test for any statistically significant differences between their mean scores (Table 7). The Bonferroni correction factor was applied to the significance level. It was found that there were statistically significant differences between the perceived importance and extent of use on all of the eight educational process components with perceived importance having significantly higher mean scores.

Table 7

Paired samples t-Test between the perceived importance and extent of use of food safety educational processes

Educational process component	Paired differences		<i>t</i>	df	P
	<i>M</i>	<i>SD</i>			
Conducting needs assessment	0.87	1.06	14.59	311	0.000
Stating objectives of the program	0.32	0.87	6.65	309	0.000
Using a variety of teaching methods	0.46	0.91	8.84	302	0.000
Revising content to incorporate recent research	0.52	0.88	10.30	308	0.000
Using program evaluation feedback in designing future programs	0.66	0.95	12.09	306	0.000
Revising teaching strategies based on research about “how learning occurs”	0.74	0.96	13.63	308	0.000
Possessing knowledge about how adults learn	0.63	0.97	11.36	310	0.000

Involving clients in planning educational programs	0.84	1.07	13.69	308	0.000
--	------	------	-------	-----	-------

*P < 0.00625

Objective 3

The mean and SD scores calculated on the extent of need for inservice education on the five identified food safety educational process need areas indicated that extension educators were in “Some” to “High” need of inservice education on all the components to more effectively conduct their food safety educational programs (Table 8).

Table 8

Mean and standard deviation scores for the food safety educational process related inservice needs

Educational process need area	<i>M</i>	<i>SD</i>	<i>n</i>
Needs assessment	2.16	0.96	321
Program planning	2.03	1.00	321
Learning systems	2.09	1.02	321
Delivery systems	2.42	1.07	321
Evaluation systems	2.58	1.04	320

0= No Need, 1= Low Need, 2= Some Need, 3= High Need, 4= Very High Need

A One-way *ANOVA* was computed to test for any statistically significant differences in the inservice needs of extension educators among the 12 states of the NCR. Bonferroni correction factor (0.05/5) was applied and the significance level was set at 0.01. It was found that there were no statistically significant differences in the inservice needs of extension educators from the different states (Table 9).

Table 9

One-way ANOVA for the educational processes related inservice needs of extension educators by state

Needs assessment	df	SS	MSS	F	P
Between groups	11	6.454	0.587	0.618	0.813
Within groups	309	293.123	0.949		
Program Planning					
Between groups	11	13.715	1.247	1.236	0.262
Within groups	309	311.836	1.009		
Learning Systems					
Between groups	11	15.336	1.394	1.343	0.199
Within groups	309	320.671	1.038		
Delivery Systems					
Between groups	11	23.130	2.103	1.870	0.043
Within groups	309	347.400	1.124		
Evaluation Systems					
Between groups	11	19.696	1.791	1.692	0.074
Within groups	308	326.026	1.056		

*P< 0.01

In addition to the five identified inservice need areas related to food safety education, the respondents were given an option to provide any additional inservice needs they had related to the educational processes used in conducting food safety educational programs. Two additional inservice need areas were predominantly identified by extension educators: (1) using new technologies in teaching; and (2) programming adaptable to various timeframes.

A few extension educators provided general comments that had implications to the inservice education being offered to food safety extension educators. Two main issues that emerged were: (1) the existing training being offered by the land-grant universities is not current and the extension educators wanted more inservice education even in the subject matter related to food safety, and (2) educating food safety educators on how to teach food safety as some educators though knowledgeable in subject matter don't know how to teach.

Objective 4

Mean and SD scores were calculated for the perceived effectiveness of the identified teaching methods and tools, and were presented in Table 10.

Table 10

Mean and standard deviation scores of extension educators based on their perceived effectiveness of teaching methods and tools used in food safety educational programs

Teaching method	<i>M</i>	<i>SD</i>	<i>n</i>	Teaching tool	<i>M</i>	<i>SD</i>	<i>n</i>
Discussion	3.04	0.752	323	PowerPoint®	2.85	0.77	313
Lecture	2.12	0.920	323	WebCt	1.44	1.18	295
Demonstration	3.49	0.647	322	Interactive Whiteboard	1.54	1.29	296
Case Studies	2.49	0.968	321	Posters	1.42	1.16	313
One-on-one instruction	3.16	0.923	321	Charts	1.63	1.19	311
Questioning	2.73	0.909	317	Internet/websites	2.37	1.09	311
Distance Education	2.03	0.978	316	Videotapes	2.12	1.03	307
Lecture-discussion	2.67	0.869	321	Compact Discs	2.05	0.98	305
Problem Solving	2.87	0.864	317	Pamphlets	2.17	1.01	309
Small group work	2.71	0.896	318	Brochures	2.15	1.00	310

Quizzes	1.79	1.06	319	Text Books	1.72	1.09	302
Learning Contracts	1.27	1.06	301	Research Publications	2.15	1.10	305
				Podcasts	1.88	1.01	290
				Newsletters	2.36	0.95	306

0= Not Effective, 1= Of little effectiveness, 2= Somewhat effective, 3= Effective, 4= Very effective

It was found that demonstrations ($M= 3.49$) were perceived to be the most effective among all the identified teaching methods followed by one-on-one instruction ($M= 3.16$) and discussion ($M= 3.04$), whereas learning contracts were perceived to be the least effective ($M= 1.27$) followed by quizzes ($M= 1.79$). It was interesting to note that none of the teaching methods was perceived to be very effective. Regarding the teaching tools, none of the identified teaching tools were perceived to be effective in conducting food safety educational programs. PowerPoint[®] had the highest mean score of 2.85 which was close to being effective with internet/websites and newsletters following with mean effectiveness scores of 2.37 and 2.36, respectively.

A One-way *ANOVA* was computed to test for any statistically significant differences in the mean perceived effectiveness scores of extension educators by state. The Bonferroni correction factor was applied and the significance levels were set at 0.004 (0.05/12) and 0.0035 (0.05/14) for the perceived effectiveness of teaching methods and teaching tools, respectively. Analysis of variance revealed that there were no statistically significant differences among the extension educators of the 12 states in their perceptions about the effectiveness of the identified teaching methods used in conducting food safety educational programs. However, in the case of the teaching tool ‘brochures’, there were statistically

significant differences in the mean perceived effectiveness scores of extension educators of North Dakota and Minnesota, and Wisconsin and Minnesota (Table 11).

Table 11

One-way ANOVA for the perceptions of extension educators by state about the effectiveness of brochures in conducting food safety educational programs

Source of Variation	df	SS	MSS	F	P
Between groups	11	27.638	2.513	2.64	0.003*
Within groups	298	283.616	0.952		

*P< 0.0035

Objective 5

Mean and SD scores were calculated for the extent of use of the identified teaching methods and tools, and were presented in Table 12.

Table 12

Mean and standard deviation scores of extension educators based on the extent of use of teaching methods and tools in food safety educational programs

Teaching method	M	SD	n	Teaching tool	M	SD	n
Discussion	2.88	0.904	321	PowerPoint®	2.22	1.54	314
Lecture	2.51	1.07	320	WebCt	0.54	.919	306
Demonstration	2.76	0.907	320	Interactive Whiteboard	0.41	.825	307
Case Studies	1.79	1.04	320	Posters	1.28	1.26	312
One-on-one instruction	2.12	1.18	320	Charts	1.82	1.15	308
Questioning	2.44	1.07	316	Internet/websites	2.11	1.17	309
Distance Education	1.35	1.09	315	Videotapes	1.53	1.16	308
Lecture-discussion	2.62	.998	318	Compact Discs	1.62	1.16	303

Problem Solving	2.10	0.987	317	Pamphlets	2.31	1.10	306
Small group work	2.16	1.06	316	Brochures	2.32	1.08	309
Quizzes	1.46	1.16	315	Text Books	1.08	1.21	302
Learning Contracts	0.57	.923	305	Research Publications	1.89	1.19	305
				Podcasts	0.56	0.85	299
				Newsletters	2.28	1.19	304

0= Not Used, 1= Rarely used, 2= Sometimes used, 3= Frequently used, 4= Always used

It was found that discussion ($M= 2.88$) was the most used among all the identified teaching methods followed by demonstration ($M= 2.76$) and lecture-discussion ($M= 2.62$), whereas learning contracts was the least used method ($M= 0.57$) followed by distance education ($M= 1.35$), quizzes ($M= 1.46$) and case studies ($M= 1.79$). It was interesting to note that none of the teaching methods were “Frequently” or “Always” used. The same trend was observed for teaching tools also with none of the teaching tools falling under “Frequently Used” or “Always Used” categories. Brochures ($M= 2.32$), pamphlets ($M= 2.31$), newsletters ($M= 2.28$) and PowerPoint[®] ($M= 2.22$) were the most commonly used teaching tools while interactive whiteboard ($M= 0.41$), WebCt ($M= 0.54$) and podcasts ($M= 0.56$) were the least used tools in conducting food safety educational programs.

One-way *ANOVA* was computed to test for any statistically significant differences in the mean scores of extension educators based on their state. The Bonferroni correction factor was applied and the significance levels were set at 0.004 (0.05/12) and 0.0035 (0.05/14) for the teaching methods and teaching tools, respectively. It was found that there were statistically significant differences in the extent of use of lecture method between the extension educators of Minnesota and North Dakota, and Minnesota and Wisconsin (Table

13), whereas there were no statistically significant differences in the extent of use of the rest of the teaching methods.

Table 13

One-way ANOVA for the extent of use of lecture method in food safety educational programs by extension educators by state

Source of Variation	df	SS	MSS	F	P
Between groups	11	44.726	4.066	3.89	0.000
Within groups	308	321.227	1.043		

*P< 0.004

In case of teaching tools, it was found that statistically significant differences existed in the extent of use of WebCt between extension educators of Illinois and North Dakota; and newsletters between extension educators of Illinois and Wisconsin and North Dakota and Wisconsin (Table 14).

Table 14

One-way ANOVA for the extent of use of WebCt and newsletters in food safety educational programs by extension educators by state

WebCt	df	SS	MSS	F	P
Between groups	11	23.777	2.162	2.71	0.002
Within groups	294	233.987	0.796		
Newsletters					
Between groups	11	39.629	3.603	2.66	0.003
Within groups	292	394.473	1.351		

*P< 0.0035

Furthermore, it was observed from Tables 10 and 12 that the perceived effectiveness scores of all the teaching methods except lecture and all teaching tools except charts, pamphlets and brochures were higher than their extent of use scores indicating that lecture,

charts, pamphlets and brochures were perceived to be less effective for teaching about food safety but used more in educational programs relative to this topic.

To test the extent of statistical significance in the difference between mean scores of perceived effectiveness and extent of use of the identified teaching methods and tools, a paired *t*-test was computed. Respective Bonferroni correction factors were applied to the significance levels of both the teaching methods' and tools' paired comparisons and the results were presented in Tables 15 and 16, respectively.

Table 15

Paired samples t-test between the extension educators' perceived effectiveness and extent of use of teaching methods used in conducting food safety educational programs

Teaching Method	Paired Differences		<i>t</i>	df	P
	<i>M</i>	<i>SD</i>			
Discussion	0.14	0.84	3.04	319	0.003
Lecture	-0.40	0.96	-7.44	318	0.000
Demonstration	0.71	0.83	15.31	317	0.000
Case Studies	0.69	0.93	13.13	317	0.000
One-on-one instruction	1.03	1.20	15.31	318	0.000
Questioning	0.27	0.87	5.56	313	0.000
Distance Education	0.66	1.17	9.92	310	0.413
Lecture-Discussion	0.03	0.82	0.82	316	0.000
Problem solving	0.75	1.01	13.29	313	0.000
Small group work	0.53	0.96	9.87	313	0.000
Quizzes	0.31	0.92	6.06	312	0.000
Learning Contracts	0.69	0.97	12.20	293	0.000

*P < 0.004

It was found that there were statistically significant differences between the perceived effectiveness and extent of use of all the identified teaching methods but for ‘distance education’. The perceived effectiveness of the rest of the teaching methods was significantly higher than the extent of their use in food safety educational programs except lecture method which had a significantly higher usage score than its perceived effectiveness.

Table 16

Paired samples t-Test between the extension educators’ perceived effectiveness and extent of use of teaching tools used in conducting food safety educational programs

Teaching Tool	Paired Differences		<i>t</i>	df	P
	<i>M</i>	<i>SD</i>			
MS PowerPoint®	0.60	1.65	6.47	310	0.003
WebCt	0.86	1.15	12.76	291	0.000
Interactive Whiteboard	1.09	1.27	14.74	293	0.000
Posters	0.12	0.92	2.45	310	0.015
Charts	-0.19	1.25	-2.7	305	0.007
Internet/websites	0.23	0.87	4.70	306	0.000
Videotapes	0.56	1.02	9.58	303	0.413
Compact Discs	0.41	0.96	7.49	300	0.000
Pamphlets	-0.16	1.00	-2.80	303	0.005
Brochures	-0.17	0.96	-3.19	306	0.002
Text Books	0.61	1.06	9.87	297	0.000
Research Publications	0.23	0.95	4.33	301	0.000
Podcasts	1.29	1.15	19.05	286	0.000
Newsletters	0.07	1.13	1.16	302	0.247

*P < 0.0035

Further, it was found that the paired mean differences between perceived effectiveness and the extent of use were significantly different statistically for all the teaching tools except posters, charts, videotapes, pamphlets and newsletters. The perceived effectiveness and extent of use scores matched with each other for these five teaching tools. Of the teaching tools that had statistically significant differences, all but brochures had a higher perceived effectiveness score than their corresponding extent of use in food safety educational programs score indicating extension educators were using brochures significantly more in their food safety educational programs though they perceived them not to be effective.

In addition to the teaching methods and tools identified by the researcher in the survey questionnaire, the respondents were given an option to provide any additional methods and tools they felt were effective in teaching about food safety. They were also asked to indicate the extent of use of the particular method or tool. 'Facilitated Dialogue' was the only additional teaching method identified by the respondents. It was perceived to be very effective and was being used frequently in food safety educational programs.

Some of the additional teaching tools identified by the respondents were: webinars, real-life props and settings, and news columns. The webinars were perceived to be effective and were being used frequently whereas news columns were perceived to be somewhat effective but were being used frequently. Real-life props and settings were perceived to be very effective and were always used in the food safety educational programs conducted by these extension educators.

Overall comments provided by extension educators

Only twenty-five extension educators provided pertinent feedback in the form of comments typed in the open-ended question provided in the questionnaire towards this purpose. These comments were analyzed and categorized under the following broad areas:

1. Extension educators should reach out to more small farmers regarding safe farm production practices.
2. Separate educational programs should be offered for food safety practices before meal preparation and after meal preparation.
3. Extension should focus more and increase its educational efforts on pre-harvest food safety practices.
4. Extension's food safety educational programs should be focused on bringing about a behavioral change in consumers rather than on providing them with only technical subject matter content. Food safety practices will not change until the perceptions of the people change. Many of them still say: "Well, my grandma always did it this way and we never got sick? Why should I change?" Most of the producers and consumers are not very serious about food safety.

CHAPTER 5

Discussion

The purpose of this study was to analyze the perceptions and the extent of use of food safety educational processes by extension educators in the Cooperative Extension System of the North Central Region of the United States. The following five specific objectives served to accomplish the study's purpose:

Identify and analyze:

1. Perceptions of extension educators regarding food safety;
2. Perceptions of extension educators regarding the educational processes related to food safety education;
3. Food safety educational processes related inservice needs of extension educators;
4. Perceptions of extension educators regarding the effectiveness of different teaching methods and tools for food safety education; and
5. Extent of use of the different teaching methods and tools by extension educators in food safety education.

Appropriate statistical tools as detailed in the findings chapter (chapter 4) were used to analyze data under each of the objectives stated above. A discussion of findings under each objective in terms of their congruence with similarly structured past studies and contribution to the existing knowledge base are presented in this chapter. Also, the findings are tied back to the theoretical framework, wherever appropriate.

This chapter is presented under the following sections: (1) demographic characteristics of extension educators, (2) perceptions of extension educators toward food safety, (3) perceptions of extension educators toward educational processes used in food

safety education, (4) extension educators' food safety educational processes related inservice needs, (5) perceptions of extension educators regarding the effectiveness of teaching methods and tools that can be used in food safety educational programs, and (6) teaching methods and tools that were being used by extension educators in their food safety educational programs.

Demographic Information of Extension Educators

Of the 768 extension educators who served as the study sample, 325 (42.31%) of those who responded to the survey had a mean work experience of about 15 years in extension and were around 49 years of age (Table 1). A majority of them were female (\approx 56%) (Figure 1) and had earned a master's degree (\approx 62%) as their highest academic degree (Figure 2). These findings appeared consistent with the findings of Camara (2006); Creswell (1990); Jayaratne (2001); Kwaw-Mensah (2008); Radhakrishna and Thomson (1996) regarding the demographic variables: age, educational level and work experience, and with the findings of Webster, Rogers, and Mariger (2001) regarding age but differed in gender distribution. All six studies reported here found that a majority of the extension educators that participated in their studies were males. However, Braiser, Barbercheck, Kiernan, Sachs, Schwartzberg, and Trauger (2009), and Selby, Peters, Sammons, Branson, and Balschweid (2005) found that a majority of extension educators in their research samples were females.

The probable reasons for this variability could be differences in the target populations and sampling procedures. Samples for the studies conducted by Camara (2006); Creswell (1990); Jayaratne (2001); and Kwaw-Mensah (2008) were drawn from a part of this study's population. However, Camara, Creswell, and Jayaratne studied only agricultural extension educators, of whom only less than 12% nationally are women (Seevers & Foster, 2004).

Traditionally, agriculture in CES has remained predominantly male dominated while program areas like family and consumer sciences have had comparatively more females serving as extension educators. This trend cuts across the formal agricultural education settings also (Foster, 2001; Koundinya & Martin (in press); Seevers & Foster, 2003). This could explain the differences in gender distribution.

In the case of Kwaw-Mensah's (2008) study, he included county extension educators from all program areas but extension educators at regional area offices were excluded. Another reason for inconsistency in gender distribution could be smaller sample size ($n=360$) compared to this study ($n=768$). Although one could argue that study samples for both studies were randomly drawn, random selection with small samples does not necessarily guarantee a sample that represents the population well (Ary et al., 2006). Therefore, it could be reasonably assumed that the findings from this study are a more accurate description of the population.

Also, there are differences in the time periods when these studies were conducted and also in the geographical locations. The studies ranged almost two decades (Creswell, 1990) to this study, which means there could have been restructuring in terms of hiring policies in CES. Also, the rest of the studies cited above were conducted with extension educators from states outside of NCR. This could be another probable reason for the variability in gender distribution among the different studies.

The work experience ($M=14.86$), age ($M=48.62$) and educational qualifications ($Mo=$ Master's degree) of extension educators indicate that a typical extension educator as defined operationally for this study was a well educated middle aged female with substantial years of work experience. A master's degree and years of service are two of the important

requisites for career advancement for extension professionals in the CES (Miller & Miller, 2009). So the findings seem to be in congruence with the policies of the CES. Overall, the demographic information indicates that extension educators in the program areas of agriculture and natural resources, family and consumer sciences, and the CEDs in the NCR are well experienced and knowledgeable individuals capable of serving their clients successfully.

Perceptions of Extension Educators Toward Food Safety

Perceptions of extension educators toward the nine identified food safety statements were measured using a five point Likert-type scale that ranged from 1 (strongly disagree) to 5 (strongly agree). The summated mean score ($M= 3.86$) indicated that extension educators had neutral perceptions toward food safety, as operationally defined for this study (chapter 4). The findings were consistent with the study of Koundinya and Martin (in press) that used a six point Likert-type scale (range= 1-6) for measuring the perceptions of Iowa agriculture teachers toward food safety. They found that Iowa agriculture teachers had moderate perceptions ($M= 4.32$) regarding food safety.

In another study that measured the attitudes of Canadian farmers towards organic farming, Egri (1999) found that Canadian government extension agents had positive perceptions about all the components that constituted organic farming except the component 'environmental concerns' on which they had moderate perceptions. And, according to Asadi, Akbari, Sharifzadeh, and Hashemi (2009) agricultural organic products (AOP) are considered an effective means to achieving food safety. In a similar study, Akbari and Asadi (2008) found that Iranian extension experts had a favorable attitude toward AOP. In a similar vein Iranian extension workers also perceived all AOP attributes to be important, indicating their

favorable perceptions toward them (Asadi et al., 2009). In a study conducted in the United States, Laminack, Dainello, Degenhart, Vestal, and Wingenbach (2008) found that Texan extension educators perceived food safety and food irradiation favorably.

Overall, the perceptions toward food safety could be considered consistent across all the studies mentioned above because none of the studies reported extension educators having negative or unfavorable perceptions regarding attributes or components related to food safety. More specifically, the findings appeared to conform to the studies of Egri (1999) and Koundinya and Martin (in press). Any differences in the levels of perceptions could be attributed to the differences in geographical locations, sample sizes, sampling methods, and more importantly the differences in the measurement scales used for identifying and quantifying the perceptions toward food safety. However, this gives an overall picture about the perceptions of extension educators regarding food safety.

Perceptions Toward the Educational Processes Related To Food Safety Education

Eight educational process components were used on a five point Likert-type scale to measure the extension educators' perceived importance that ranged from 0 (not important) to 4 (highly important) for, and the extent of use that ranged from 0 (not used) to 4 (always used). The extension educators seemed to perceive the identified educational processes to be important (*M* ranged from 2.86-3.53 Table 4) for conducting their food safety educational programs. Overall, the findings appeared to be consistent with the findings of Camara (2006), Creswell (1990), Jayaratne (2001), and Kwaw-Mensah (2008). All five studies had different components (perception statements) for measuring the perceptions of extension educators toward the educational processes but the underlying theme was similar.

Camara (2006) found that the respondents had a summated mean score of 3.86 on 5.00 for the components that constituted the teaching-learning process related to water quality issues in the NCR. The participants in his study seemed to agree with the statement “Training programs should be built around the target participants’ needs...” (p.96), and the same statement recorded positive perceptions from extension educators in Jayaratne’s (2001) study also, indicating that needs assessment was important for conducting extension educational programs. However, the findings from this study do not conform to Camara’s and Jayaratne’s studies relative to the ‘needs assessment’ component. Extension educators in this study perceived assessing clients’ needs before conducting food safety educational programs to be only of somewhat important to important. This is an interesting finding in the light of overwhelming extension education literature that suggests the importance of needs assessment to the success of any extension educational activity. However, it should be made clear that needs assessment was understood as being important, just not as much as in other studies.

Regarding the other educational process components, Kwaw-Mensah (2008) found that extension educators in NCR had positive perceptions toward using a variety of teaching methods in educational programs, involving clients in educational program planning, and possessing knowledge about how adult learners learn. The findings from this study were consistent with Kwaw-Mensah’s study relative to these three educational process components. Furthermore, the findings from this study were congruent with that of Creswell’s (1990) who found that extension educators from Iowa, Nebraska, North Dakota and Wisconsin tended to agree that a variety of teaching methods should be used; objectives should be clarified before starting the educational program; evaluation is necessary and a

variety of evaluation methodologies should be used; and individual differences among the learners should be recognized.

The next important question to be answered was whether these perceptions were consistent among the 12 states of NCR or were there any statistically significant differences. One-way *ANOVA* was computed toward that end, and the findings indicated that the perceptions were consistent among the states (Table 5). Creswell (1990) found that the perceptions of extension educators relative to use of the teaching-learning process principles like using a variety of teaching methods in pesticide educational programs for private pesticide applicators, clarifying program objectives, using different evaluation methodologies, and recognizing individual differences among the learners were consistent among the extension educators of Iowa, Nebraska, North Dakota and Wisconsin.

An interesting point that emerged from studying the perceptions of extension educators regarding food safety educational processes was that although the different studies cited above measured perceptions toward different agricultural topic areas like irrigation water quality issues, sustainable agriculture, livestock waste management, pesticide trainings and food safety, the underlying principles related to educational processes were perceived to be important for the success of educational programs. These findings appear to be in line with the tenet of the Theory of Expert Competence postulated by James Shanteau (1992) that the knowledge domain alone is not sufficient for competence of experts. Thus, it is imperative that extension educators of NCR need competence in the educational processes in addition to their technical expertise in food safety for successfully educating their clients.

Furthermore, it was found that extension educators were not using ($M= 1.95-3.00$ Table 4) the identified educational processes to the extent they perceived them to be

important. Especially, extension educators were conducting a needs assessment only ‘rarely to somewhat’ before conducting food safety educational programs. The same trend as found by one-way *ANOVA* prevailed among extension educators of all 12 states. The reasons could be many for this finding and need to be found out in future research. The results from the paired *t*-test indicated that there were statistically significant differences between the perceived importance and extent of use of all eight identified educational process components with perceived importance having significantly higher mean scores than the extent of use (Table 7).

This might suggest that perceptions related to importance were not getting translated into behavior in terms of adoption which does not coincide with the tenet of Ajzen’s Theory of Planned Behavior: ‘*perceptions influence behaviors*’. However, caution needs to be exercised for interpreting this causal relationship mainly for two reasons:

1. This study employed a descriptive survey design which offers no control on extraneous variables that could affect a dependent variable (extent of use in this case). The research design needs to be causal-comparative or ex-post facto, or higher for inferring a causal relationship between variables (Ary et al., 2006), and
2. There might be other better indicators of perceptions other than/in addition to perceived importance that could influence the behavioral trait: extent of use.

Further, there could be some inhibitory factors as suggested by Dijksterhuis and Bargh (2001) over which extension educators may not have any control. Some probable inhibitory factors could be rigid organizational frames (Bolman & Deal, 1991), lack of expertise in the educational processes (Allison, 1990; Bailey & Deen, 2002; Chapman-Novakofski, et al., 1997; Gibson & Hillison, 1994; Jayaratne, Lyons, & Palmer, 2008;

Radhakrishna, 2001), and lack of time and other resources as indicated by one of the respondents from this study. This extension educator commented: “Often, it is not the lack of knowledge of the above areas, but rather a lack of time to complete all of the above for each program offered based on a diminishing staffing configuration at the local and state level[s]”. However, these findings do indicate a future research area.

Additionally, Morford, Kozak, Suvedi, and Innes (2006) studied the evaluation behaviors of Natural Resource Extension Practitioners (NREPs) and found demographics like age and work experience; beliefs that their job performance is assessed based on evaluation behaviors and evaluation is not being conducted just for accountability sake; and institutional factors like hiring evaluation specialists to be some factors affecting extension educators’ evaluation behaviors. Any one of these items could also be an inhibitory factor for extension educators in not using the identified educational processes in their educational programs to the extent they perceived them to be important.

Food Safety Education Processes Related Inservice Needs

Five educational process areas: (1) needs assessment, (2) program planning, (3) learning systems, (4) delivery systems and (5) evaluation systems were identified as inservice topic areas based on the framework developed by the NCR-158 Committee on Adult Education in Agriculture (1990). Extension educators indicated their perceived inservice need on a Likert-type scale that ranged from 0 (no need) to 4 (very high need). It was found that extension educators were in need of education on all of the identified areas (Table 8). Furthermore, One-way *ANOVA* indicated that there were no statistically significant differences in the perceived inservice needs among the states (Table 9), indicating that all extension educators in the NCR needed inservice education in all five identified inservice

topic areas. These findings appeared to conform to the existing literature base and past research studies conducted on extension educational process competencies.

You, Extension and Success! (YES), a competency-based professional development framework developed by the Texas Extension Service has identified program development and evaluation as the required competencies for extension educators (Stone & Coppernoll, 2004). But, there is a high variability among extension practitioners' evaluation practices from person to person and also from state to state (Morford et al., 2006). Therefore, Morford et al. recommended training programs to increase the confidence of extension educators in conducting program evaluations. Chapman-Novakofski, et al., (1997); Bailey and Deen (2002); and Jayaratne, Lyons, and Palmer (2008) concurred with these findings that extension educators don't have a strong background in evaluation, and hence needed training on evaluation methodologies (Gibson & Hillison, 1994; Radhakrishna & Martin, 1999).

Similarly, in a study conducted by Gibson and Hillison (1994) with North Carolina CES professionals, competence in program planning and educational processes were perceived to be important for conducting educational programs. Further, it was found that extension agents were in need of education in the educational processes. On a similar note, Radhakrishna (2001) found that Clemson university extension specialists were in need of inservice education on conducting needs assessments. In another study, Schwarz and Gibson (2010) identified the needs of extension professionals in the CSREES listserv entitled AQUA-EXT and found that they needed training in areas like program evaluation and web-based education programming. Specifically, extension agents perceived a greater need in the educational processes like knowledge and principles in teaching adults. In summary,

extension educators in the NCR and also from states outside of the NCR appear to be in need of inservice education relative to the identified food safety educational process topic areas.

Teaching Methods and Tools Used In Food Safety Educational Programs

Twelve teaching methods and fourteen teaching tools were identified, and extension educators were asked to rate the perceived effectiveness and the extent of use on Likert-type scales that ranged from 0 (not effective) to 4 (very effective) and 0 (not used) to 4 (always used), respectively. Extension educators perceived demonstrations as most effective for food safety education followed by one-on-one instruction and discussion methods, whereas learning contracts were perceived to be least effective (Table 10). None of the methods was perceived to be very effective. Also, none of the identified teaching tools was perceived at least to be effective, with PowerPoint® perceived close to being effective followed by internet/websites and newsletters. Pamphlets, brochures, research publications, videotapes, and compact discs were perceived to be close to ‘somewhat effective’ (Table 10).

The findings appeared to be consistent with the studies of Shinn (1997), Jayaratne (2001), Camara (2006) and Kwaw-Mensah (2008). Shinn found that teachers of agriculture in the United States perceived laboratories to be effective followed by demonstrations, projects and real objects for teaching agriculture. Jayaratne found that extension educators perceived demonstrations to be most effective followed by one-on-one instruction and group discussion for educating learners on a sustainable agricultural technology like Integrated Pest Management (IPM). His findings also indicated that lecture was ineffective for IPM education. Camara and Kwaw-Mensah reported that extension educators perceived demonstrations to be the most effective teaching method to teach about water quality issues and livestock waste management, respectively.

In the case of teaching tools, field days, study tours and workshops were perceived to be effective for IPM education whereas printed materials were found to be only moderately effective (Jayaratne, 2001). Similar results were achieved by Camara (2006) in his study on the teaching learning processes related to water quality issues. Kwaw-Mensah (2008) found that extension educators perceived internet, computers, newsletters and research publications to be effective in livestock waste management education.

One-way *ANOVA* analysis revealed that there were no statistically significant differences among the extension educators of different states in the perceived effectiveness of teaching methods. The same trend was observed for all teaching tools except brochures for which there was a statistically significant difference between the extension educators of North Dakota and Minnesota, and Wisconsin and Minnesota with North Dakota and Wisconsin extension educators perceiving them to be significantly more effective than extension educators from Minnesota (Table 11).

In the case of the extent of use, discussion method was most used followed by demonstrations and lecture-discussion in food safety educational programs whereas learning contracts was found to be the least used teaching method followed by distance education, quizzes, and case studies (Table 12). Discussion has been identified as an inclusionary and participatory teaching method that facilitates critical thinking skills in learners (Brookfield, 2004), which is an essential component of food safety education especially while teaching safe food practices and behaviors. Also, this teaching method is the most respectful of learners, which is one of the important considerations for educating adult learners, and places the educator and learners on equal footing as it assumes that everyone has a useful contribution to make to the educational program (Brookfield). Jarvis (2004) identified

discussions as a student-centered teaching method. Thus it can be reasonably deduced that food safety extension educators of the NCR are adopting learner-centered approaches to their food safety educational programs by using discussions more often than the other identified teaching methods.

The second most used teaching method was demonstrations, which is useful in imparting skills to learners. One of the basic principles in extension work is 'learning by doing' (Reddy, 1993) and the doing part is provided well by demonstrations. There are some specific skills the learners should learn related to safe food practices, and demonstrations serve this purpose better. Demonstrations are also useful from the extension educators' perspective as they make an economical use of time, equipment and materials (Gilley, 2004). However, one of the requirements for using demonstrations as a teaching method is that extension educators need to be competent in depicting the demonstration as close to the real life situation as possible (Gilley). This has implications for the inservice education of extension educators. Since demonstrations involve hands-on activities for the most part they can be considered a learner-centered strategy.

The third most used teaching method for food safety education was lecture-discussion. A brief lecture is necessary in educational programs for identifying and clarifying concepts (Farrah, 2004). There are some complex scientific facts that learners need to know about food safety (Barton & Barbeau, 1992), and extension educators could use a brief lecture for accomplishing that purpose. And, if this is followed by a discussion it is possible that the technical knowledge gained through the lecture can be furthered into practical or communicative knowledge, which could lead to emancipatory knowledge that occurs as a consequence of reflecting on technical and practical knowledge (Cranton, 2006).

Once both technical and communicative knowledge are gained, there exists a great possibility for ‘transformative learning’ to occur which is the goal of most adult education programs like the food safety educational programs offered by extension educators in the NCR.

Further, the foregoing discussion on the extent of use of teaching methods helps identify the adult education philosophies of food safety extension educators. Elias and Merriam (1980) proposed five adult education philosophies: liberal, progressive, behaviorist, humanist, and radical. They identified discussion and demonstration methods as being used by adult educators espousing liberal adult education philosophy. Brookfield (2004) reinforced the idea that “discussion” as a teaching method has humanistic and radical traditions of adult education. Further, Elias and Merriam indicated that adult educators espousing progressive and humanistic adult education philosophies adopt teaching methods that provide experiential, hands-on learning activities implying that demonstrations are based on these philosophies. Therefore, it can be reasonably assumed that food safety extension educators in the NCR were espousing a combination of liberal, humanistic, progressive and radical adult education philosophies and not one particular philosophy, which is in congruence with the findings of Boone, Gartin, Wright, Lawrence, and Odell (2002) that agricultural educators in the tri-state area of Pennsylvania, West Virginia and Virginia did not have a clearly defined adult education philosophy.

Furthermore, it was found that none of the identified teaching methods was frequently or always used. This might suggest that extension educators were using multiple teaching methods and not relying excessively on any one particular method, which is one of the ways of adding variability to adult education settings (Garton, 1999). Lynn (1996) suggested that a

variety of strategies should be used in food safety educational programs (as cited by Costello, Gaddis, Tamplin, & Morris, 1997). The use of multiple teaching methods is also supported by Hall, McKinnon, Greiner and Whittier (2004), Ota, DiCarlo, Burts, Laird, and Gioe (2006), and Rodewald (2001). So, it can be assumed that extension educators of the NCR were doing a good job of using a combination of different teaching methods in their food safety educational programs.

The findings regarding the extent of use of teaching methods and tools appeared to be consistent with past related studies. Shinn (1997) found that teachers of agriculture in the United States more often used demonstrations followed by discussion. Kwaw-Mensah (2008) also reported discussion and lecture-discussion to be among the more often used teaching methods by extension educators of the NCR in livestock waste management education. From the learners' perspective, Reisenberg and Gor (1989) found that farmers preferred demonstrations to learn about innovations. Israel and Ingram (1991) emphasized the importance of demonstrations in building trust among the learners. Also, demonstrations have been found to be effective in technology transfer activities (Hall, McKinnon, Greiner, & Whittimer, 2004).

On the other hand, Shinn (1997) found that learning contracts, distance education and case studies were not being used much by agricultural educators in the United States which is in line with the findings from this study. Berger, Caffarella, and O'Donnell (2004) suggested that learning contracts can be used in a variety of settings with diverse adult learners. Also, they indicated that learning contracts are useful in helping learners gain skills in learning as well as content, and in catering to the individual differences in the learners. Therefore, extension educators may explore this option in their food safety educational programs.

However, one of the limitations with learning contracts is it demands more time on the part of the educator (Berger, Caffarella & O'Donnell) which could well be the reason for its lesser use by food safety extension educators of the NCR, and research indicates that extension educators do have time constraints (Camara, 2006; Jayaratne, 2001).

In the case of distance education, it is becoming commonplace in many universities of the United States (Roberts & Dyer, 2005), and is in use in developing countries like India also (Koundinya, 2000). Koundinya and Duttala (2002) researching in India found that distance education in the form of a farm telecasting program contributed to a statistically significant gain in farmers' knowledge of groundnut and mango cultivation practices. In the United States, Dooley, Van Laanen, and Fletcher (1999) found that distance education methods like videoconferencing were effective in disseminating food safety updates. They reported an increase in the knowledge of Food Protection Management instructors that participated in a food safety instructor training via distance education methods. Shanley, Thompson, Dzuira-Duke and Rodriguez (2009) concurred that distance education was indeed an effective method for food safety education. Therefore, it is recommended that extension administrators should encourage extension educators to explore utilizing distance education strategies (Cecil & Feltes, 2002) in their food safety educational programs.

A very interesting finding was that case studies were being used only rarely to sometimes ($M= 1.79$) in food safety extension educational programs. Creswell (1990) also found that case studies were not heavily used by agricultural extension professionals in training private pesticide applicators in Iowa, Nebraska, North Dakota and Wisconsin. Case studies have been identified as one of the more effective teaching methods that promote active learning. A case study approach gives in-depth information (University of Idaho,

2006), and can be used to answer how and why questions and when contemporary issues in real-life context are being studied (United States Department of Veteran Affairs, 2008; Yin, 2003). Case studies as a teaching method have been found to improve practical thinking, and help learners formulate problems and solve them (Marsick, 2004) which are the skills that are needed by learners in food safety educational programs.

In the case of teaching tools, brochures were most used followed by pamphlets, newsletters and PowerPoint[®] whereas interactive whiteboard, WebCt and podcasts were the least used teaching tools by food safety extension educators (Table 12). None of the teaching tools was found to be frequently or always used. Extension education literature indicates the utility of these teaching tools in educational programs. Roberts, Remig, Bryant, and Snyder (2009) reported that adult learners preferred newsletters for receiving information on food safety. Jenkins, Newman, Castellaw, and Lane (2000) concurred with this finding that newsletters are effective in reaching out to more people.

Marrotte (2000) found that learners preferred PowerPoint[®] presentations. In addition, podcasts have also been found to be useful in extension educational programs (Smith & Davis, 2008; Xie & Gu, 2007) but the food safety extension educators from this study were not utilizing podcasts that much in their educational programs. The same was true for interactive teaching media and materials which have been found to be useful in food safety educational programs (Bednar, Kwon, Baker, & Kennon, 2003; Trepka, 2008). In the same vein, WebCt is being used as a teaching tool in many distance education programs at land grant institutions (example Iowa State University). Since the extension educators were not using distance education methods much in their food safety educational programs, WebCt as a teaching tool was also being used less.

Further, results from One-way *ANOVA* analysis revealed that there were no statistically significant differences in the extent of use of all teaching methods except lecture method that had statistically significant differences in the extent of use between the extension educators of Minnesota and North Dakota, and Minnesota and Wisconsin (Table 13). In the case of teaching tools there were statistically significant differences in the use of WebCt between the extension educators of Illinois and North Dakota, newsletters between extension educators of Illinois and Wisconsin, and North Dakota and Wisconsin (Table 14). The reasons for this need to be explored in future research.

Furthermore, the perceived effectiveness scores of all teaching methods except lecture and all teaching tools except charts, pamphlets and brochures were higher than their extent of use scores. Here again, there is indication of perceptions not getting translated into behavior which goes against Ajzen's Theory of Planned Behavior. And, the reasons that were discussed for the extent of use of the educational processes being less than their perceived importance, hold good for this case, also. Also, caution needs to be exercised for inferring this causal relationship because of the very same reasons that were discussed under the educational processes.

The results from a paired *t*-test revealed that there were statistically significant differences between the perceived effectiveness and extent of use of all teaching methods but distance education (Table 15). The same trend prevailed with a majority of the identified teaching tools, also. Teaching tools: posters, charts, videotapes, pamphlets and newsletters had no statistically significant differences between the perceived effectiveness and the extent of use (Table 16). The only exception to this trend was brochures that were being used more than the extent of its perceived effectiveness. The probable reasons for the significantly

greater usage of brochures in food safety educational programs than their perceived effectiveness could be that they can be used to disseminate information to a large mass of people and they are also convenient take home educational materials.

Extension educators additionally identified the teaching method: facilitated dialogue, and teaching tools: webinars, real-life props and settings, and news columns to be used in their food safety educational programs. Thomson, Abel, and Marezki (2001) indicated facilitated dialogue as a method of educating people on food, farm and community. Small, Waterbury, and Mark (2008) used webinars as an educational tool in a livestock insurance website. Further, the additional comments provided by extension educators were categorized into four broad areas, one of them being: extension's food safety educational programs should be focused on bringing about a behavioral change in consumers rather than on providing them with only technical subject matter content. Roseman and Hayek (2005) found that food safety education to people in home-delivered meal programs produced positive changes in food safety behaviors implying that food safety extension educators in the NCR could play an important role in bringing about behavioral changes in their clients' food safety behaviors.

A Food Safety Education Delivery Model for Extension Educators of the North Central Region

A food safety education delivery model (Figure 4) was developed for extension educators of the NCR with the aim of improving the overall food safety educational delivery process. The model was developed predominantly based on the findings from this study and from a review of the literature. This model has implications for both inservice education of extension educators and delivery of information to clients.

The food safety education delivery model proposes that food safety education to clients mainly depends on competence of extension educators. Therefore, inservice education assumes significance. This model proposes that inservice education for food safety extension educators should focus on three main components:

1. Psychological constructs like ‘perceptions’ of extension educators
2. Educational processes
3. Subject matter

The findings from this study indicated that extension educators had neutral perceptions toward food safety ($M= 3.86$ on 5.00) and the food safety educational processes ($M= 2.86-3.53$ on 4.00 for eight educational processes statements). Research shows that perceptions influence behavior implying that perceptions held by extension educators about food safety and the educational processes relative to food safety might influence behavioral traits related to educational programming. Therefore, perceptions of extension educators need to be resolved through inservice education so they are able to better communicate with clients. Hence, this model identifies ‘perceptions’ as the first component under inservice education.

Further, the mean scores ($M= 2.03-2.58$ on 4.00) on the inservice needs of extension educators related to the food safety educational processes topic areas viz., (1) needs assessment, (2) program planning, (3) learning systems, (4) delivery systems, and (5) evaluation systems, indicated that they were in need of education on all five of these areas. Also, there is an overwhelming amount of literature (cited in chapters 2 and 5) that supports this finding. Therefore, the ‘educational processes’ segment was proposed as the second component of inservice education for extension educators.

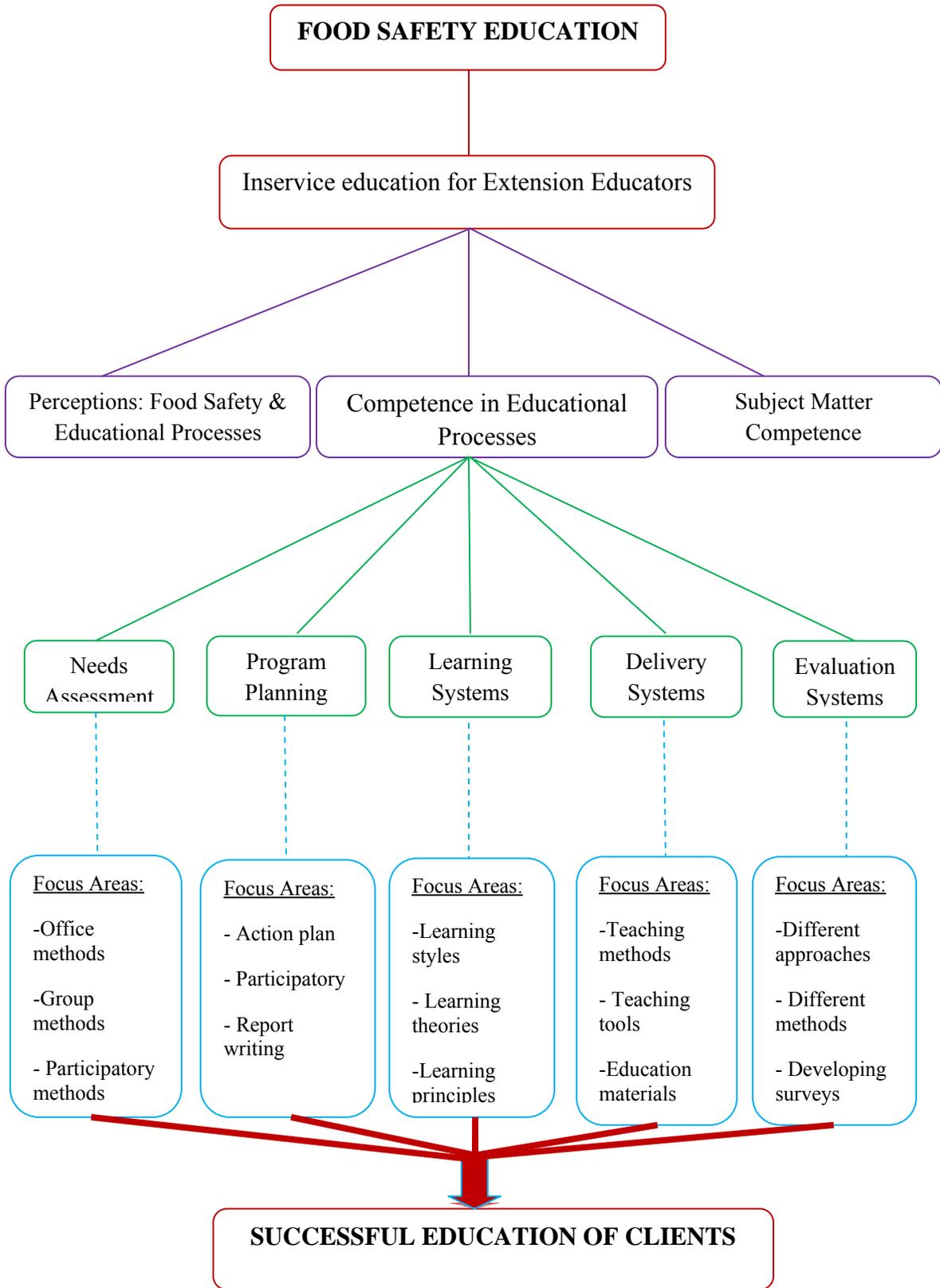


Figure 4. Food safety education delivery model

Furthermore, this model identifies the following components gleaned from the literature under each of these five topic areas as ‘focus areas’ for inservice educational programs:

1. Needs assessment: office techniques, group techniques and participatory techniques as methods of assessing needs,
2. Program planning: participatory methods, development of action plans and report writing,
3. Learning systems: learning styles, learning theories and learning principles,
4. Delivery systems: teaching methods, teaching tools and development of educational materials,
5. Evaluation systems: different evaluation approaches and methodologies, and developing survey instruments

A brief description of the proposed ‘focus areas’. Needs assessment is essential to proper planning. Needs can be assessed using office and group techniques as identified by Etling (1995). He suggested resource inventory forms, review of file records, future projection wheels, and reflective listening while attending office/telephone calls as some of the office techniques, and nominal group process, county form, focus group interview, and brainstorming as some of the group techniques. Food safety extension educators should be educated on these techniques during inservice programs.

Further, this model proposes development of an ‘action plan’ as the most important component related to food safety educational program planning. The action plan format developed by Martin (2009) is recommended for planning food safety extension educational programs. An action plan consists of four components: (1) objectives, (2) strategies, (3)

activities and (4) evaluation (Martin). Extension educators should be trained on how to develop these four components. Another important program planning requirement is involving stakeholders in the planning process. This participatory approach to planning extension programs is gaining importance all over the world. Therefore, the ways of doing this should be taught to extension educators who are mostly used to planning programs according to the mandated requirements. Also, this model identifies report writing as another program planning component, and extension educators, especially new recruits should be trained on the specific writing styles.

Once the food safety educational program is planned, the next important step is designing the learning situation, and three components: learning styles, learning theories and learning principles should be made a part of inservice training for extension educators. The findings from this study indicated that extension educators were using a variety of teaching methods in their food safety educational programs which could indicate that they were catering to the various learning styles and also considering the important learning principles and theories in their food safety educational programs. But, one cannot rule out the possibility of extension educators using some particular teaching methods without really understanding the essential teaching-learning principles or theories behind them. Therefore, this model identifies these three components as focus areas for food safety inservice educational programs. The next important step is development of curriculum, and extension educators need to be trained on the various options that are available to develop food safety educational materials for their programs.

Further, research (cited under the discussion of food safety educational process related inservice needs) shows that extension educators are not competent at evaluation

processes. Therefore, they need to be trained on various evaluation approaches, methodologies, and on developing survey instruments. The different approaches suggested by Fitzpatrick et al (2004) are recommended as topic areas under this component of inservice education.

In addition, the professional development programs conducted for extension educators in CES focus mostly on subject matter, and it is a fact that having good domain knowledge is a prerequisite for being an expert (Shanteau, 1992). So, this model proposes 'subject matter' as the third component of inservice education. Once the extension educators are educated based on the three proposed components of inservice education, it is believed that they will be able to more successfully communicate with their clients.

Furthermore, results from one-way *ANOVA* on perceptions, inservice needs, and extent of use of teaching methods and tools indicated that there were no statistically significant differences among the extension educators of the 12 states of NCR on most of the areas. So the proposed food safety education delivery model is recommended for improving the food safety educational programming in the NCR.

CHAPTER 6

Summary, Conclusions and Recommendations

Summary

Food is basic to the existence of human beings and consumption of safe food is essential for staying healthy. Foodborne illnesses are increasing all over the world with the United States being no exception (Motarjemi & Kaferstein, 1999). The number of foodborne illness-related cases the Centers for Disease Control and Prevention reports every year is a testimony to this fact. In addition, lack of food safety measures has severe economic implications that affect businesses (Guion, Simonne, & Easton, 2004). The knowledge about agriculture (Blackburn, 1999; NRC, 1988) and food safety (Altekruse, Steet, Fein & Levy, 1995) held by the American public is not very high. Therefore, food safety education assumes significance. There are many food safety education providers in the United States, with the Cooperative Extension Service (CES) of the land-grant universities being the most reliable and unbiased source (Feller et al., 1984 as cited by McDowell, 2001) owing to its service being grounded in research (McDowell, 2001).

This study sought to analyze the perceptions and the extent of use of food safety educational processes by extension educators in the Cooperative Extension System of the North Central Region of the United States, and draw implications for: (1) better delivery of food safety education to clients and (2) inservice education of extension educators. The following five specific objectives served to accomplish the study's purpose:

To identify and analyze:

1. The perceptions of extension educators toward food safety;

2. The perceptions of extension educators toward the educational processes related to food safety education;
3. The food safety educational processes related inservice needs of extension educators;
4. The perceptions of extension educators regarding the effectiveness of different teaching methods and tools for food safety education; and
5. The extent of use of the different teaching methods and tools by extension educators in food safety education.

Ajzen's Theory of Planned Behavior served as the theoretical framework for this study with the main focus on one of the tenets of the theory: *perceptions influence behaviors*. Also, the findings on the educational processes were related to James Shanteau's Theory of Expert Competence, and the findings on teaching methods were related to the adult education philosophies proposed by Elias and Merriam.

The target population for this descriptive cross-sectional sample survey consisted of all extension educators in the program areas of Family and Consumer Sciences and Agriculture and Natural Resources, and the County Extension Directors (CEDs) in the NCR of the U.S. Seven hundred sixty eight extension educators served as the survey sample that was over sampled by 100% in an anticipation of a 50% response rate, which was decided based on past research studies. A disproportionate stratified sample of 64 extension educators from each of the 12 strata (states) of NCR was randomly selected. An electronic questionnaire developed using SurveyMonkey[®] was used to collect the data. The expert panel-validated questionnaire consisted of seven sections. Sections I, II, III, IV and V used five point Likert-type scales, and Sections VI and VII used open-ended and close-ended questions. The Cronbach's α values for reliability ranged from 0.729 to 0.905, which were

considered reliable according to George and Mallery (2003). Data were analyzed using SPSS[®] Version 17.0.

Demographic data revealed that the extension educators responding to the study had a mean work experience and age of 14.86 and 48.62 years, with standard deviations of 10.04 and 10.85, respectively. A majority of the respondents were female, and had earned a master's degree. Further findings indicated that extension educators had neutral perceptions about food safety and seemed to perceive the identified educational processes as important. But, these positive perceptions seemed not to be reflected in the behavioral trait: extent of use, as evidenced by statistically significant higher mean scores for the perceived importance compared to the extent of use. Overall, the same trend was observed with the perceived effectiveness of the teaching methods and tools used in food safety education vs. their extent of use except for the teaching method: distance education and teaching tools: posters, charts, videotapes, pamphlets and newsletters. The only exceptions to this trend were 'lecture' and 'brochures' which were being used significantly more in food safety educational programs compared to their perceived effectiveness scores.

One-way *ANOVA* conducted for testing any statistically significant differences among the extension educators of the 12 states of NCR on the perceived importance and extent of use of the identified food safety educational processes, and perceived effectiveness and extent of use of teaching methods and tools in food safety educational programs revealed that overall, there were no such differences. However, differences were recorded in the perceived effectiveness of brochures between the extension educators of North Dakota and Minnesota, and Wisconsin and Minnesota. In the case of extent of use, lecture method and teaching

tools WebCt and newsletters recorded statistically significant differences. Statistically significant differences were found between the extension educators of Minnesota and North Dakota, and Minnesota and Wisconsin on the extent of use of lecture, whereas there were significant differences between extension educators of Illinois and North Dakota on the extent of use of WebCt, and between extension educators of Illinois and Wisconsin, and North Dakota and Wisconsin on the extent of use of newsletters.

Regarding the inservice needs related to the five identified food safety educational processes topic areas: (1) needs assessment, (2) program planning, (3) learning systems, (4) delivery systems and (5) evaluation systems, it was found that extension educators were in need of education on all of the identified areas. Further, One-way *ANOVA* indicated that there were no statistically significant differences in the perceived inservice need among the states indicating the need of more education for all extension educators of the NCR. Furthermore, a food safety education delivery model was developed, predominantly based on the findings of this study and from a review of the literature.

Conclusions

The following nine conclusions were drawn based on the findings of the study:

1. Extension educators that participated in this study were mainly middle-aged women with substantial years of work experience and held a master's degree.
2. The extension educators had moderate perceptions about food safety. Their perceptions about 'food irradiation' seemed to be mixed.
3. Extension educators were using all the educational processes except 'needs assessment' close to the "frequently used" category. Needs assessment was not

- being used as much compared to previous related studies and extension education literature.
4. Perceptions of extension educators regarding the importance of educational processes and effectiveness of teaching methods and tools in food safety educational programs appeared to show a low extent of use of many of these methods and tools.
 5. The perceptions of extension educators toward food safety, food safety educational processes, teaching methods and tools, and the extent of use of the identified educational processes and teaching methods and tools remained consistent across the 12 states of the NCR.
 6. Extension educators seemed to use a variety of teaching methods in their food safety educational programs as evidenced by none of the teaching methods being reported as frequently used.
 7. Extension educators were not making extensive use of ‘distance education’ and ‘case studies’ as teaching methods in their food safety educational programs.
 8. Extension educators seemed to espouse a combination of liberal, humanistic, progressive and radical adult education philosophies, and adopt a learner-centered approach as evidenced by the use of discussions, demonstrations and lecture-discussion teaching methods the most in their food safety educational programs.
 9. Extension educators needed inservice education on all of the five identified food safety educational process topic areas.

Recommendations

Recommendations for action. The following recommendations for action were made based on the findings and conclusions of the study:

1. The perceptions of extension educators toward food safety and educational processes related to food safety should be addressed during inservice education programs.
2. Reasons for extension educators not using the educational processes and teaching methods and tools to the extent they perceived them to be important or effective need to be discovered and addressed.
3. Extension educators should utilize distance education technologies more in their food safety educational programs.
4. Extension educators should use more case studies in their food safety educational programs as they promote active contextual learning.
5. The proposed food safety education delivery model should be utilized in developing food safety education programs in the NCR.

Recommendations for further research. This study found the following potential research areas that need to be addressed by further research:

1. The study needs to be replicated in the remaining 38 states of the United States so different perspectives could emerge that could validate this study.
2. A study should be conducted analyzing the various organizational factors: structural, political, symbolic and human resource as suggested by Bolman and Deal, that affect the food safety educational programming of extension educators.
3. This study did not establish a causal relationship between perceptions and behavior of extension educators related to food safety educational processes and teaching

methods and tools. A causal-comparative or experimental study needs to be conducted to test this potential relationship.

Implications and Significance to Agricultural &/or Agricultural Extension Education

The purpose of this study was to analyze the food safety teaching-learning processes adopted by extension educators in the CES of the NCR. Findings from this study were based on the data collected from a disproportionate random sample of extension educators in the NCR, and hence can be generalized to the total population. The findings may also have implications for food safety extension educators throughout the country. There are implications from this study for planning and delivering food safety educational programs to clients, and inservice education of extension educators. Further, these findings are also pertinent to: extension educational programs offered on other agricultural topics; agricultural educational programs conducted in formal settings; and food safety educational programs offered in developing countries.

The perceptions of extension educators toward food safety, food safety educational processes, and various teaching methods and tools were analyzed. As perceptions influence peoples' behavior, it is important to address them through inservice education (as identified in the food safety educational delivery model (Figure 4) developed by the researcher). Therefore, food safety inservice educational programs should include a session focused on discussing the perceptions of extension educators about food safety issues so a common ground is established among the extension educators.

Further, this study found extension educators' extent of use of different teaching methods and tools in their food safety educational programs. These findings could be used in improving the food safety educational delivery process for clients. For example, it was found

that the respondents were not using 'case studies' and 'distance education' teaching methods to any great extent in their food safety educational programs. Such findings have implications for inservice education of extension educators also so they may get trained in aspects related to using these two teaching methods more efficiently.

Additionally, it was found that extension educators were in need of inservice education on using all five food safety educational processes in their educational programs. The five educational process topic areas identified for this study: needs assessment, program planning, learning systems, delivery systems and evaluation systems can be considered while designing inservice programs. Besides, the different focus areas (given as 'components' in the food safety educational delivery model) under each of the educational process topic areas can serve as educational topics for inservice programs.

Further, the findings from this study, and the survey questionnaire used for this study have implications for designing future studies focused on educational processes in nonformal and formal agricultural educational settings. They could serve as potential Likert items or questions in the research survey instruments.

Lastly, this study has significant implications for conducting research in developing countries where food safety education is an indispensable component in most all food safety efforts. The researcher hails from India, the second most populous country/developing country in the world where there are huge health and economic implications related to lack of food safety (Sanborn, 2007). So, the findings from this research have implications to the researcher's native country, who intends to conduct a similar study there in the future with the Agricultural Officers in the Departments of Agriculture, and food safety extension

professionals and educators working with the Ministries of Agriculture and Health & Family Welfare.

APPENDIX A. INSTITUTIONAL REVIEW BOARD APPROVAL FORM

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Institutional Review Board
Office of Research Assurances
Vice President for Research
1138 Pearson Hall
Ames, Iowa 50011-2207
515 294-4566
FAX 515 294-4267

DATE: March 19, 2009

TO: Vikram Swaroop Chandra, Koundinya
206C Curtiss Hall

CC: Dr. Robert A. Martin
201 Curtiss Hall

FROM: Jan Canny, IRB Administrator
Office of Research Assurances

TITLE: **An analysis of the food safety educational processes in the Cooperative Extension System of the North Central Region of the United States**

IRB ID: 09-114 **Study Review Date:** 18 March 2009

The Institutional Review Board (IRB) Chair has reviewed this project and has declared the study exempt from the requirements of the human subject protections regulations as described in 45 CFR 46.101(b). The IRB determination of exemption means that:

- **You do not need to submit an application for annual continuing review.**
- **You must carry out the research as proposed in the IRB application**, including obtaining and documenting (signed) informed consent if you have stated in your application that you will do so or if required by the IRB.
- **Any modification of this research should be submitted to the IRB on a Continuing Review and/or Modification form, prior to making any changes**, to determine if the project still meets the Federal criteria for exemption. If it is determined that exemption is no longer warranted, then an IRB proposal will need to be submitted and approved before proceeding with data collection.

Please be sure to **use the documents with the IRB approval stamp** in your research.

Please note that you must submit all research involving human participants for review by the IRB. **Only the IRB may make the determination of exemption**, even if you conduct a study in the future that is exactly like this study.

For IRB Use Only	Review Date: _____	IRB ID: <u>09-114</u>
	Approval Date: _____	Length of Approval: _____
	Approval Expiration Date: _____	FULL Committee Review: _____
	EXEMPT per 45 CFR 46.101(b) 1, 2 Date: <u>3/10/09</u>	Minimal Risk: <input checked="" type="checkbox"/>
	EXPEDITED per 45 CFR 46.110(b) _____	More than Minimal Risk: _____
	Category _____, Letter _____	Project Closed Date: _____

ONG

IRB

ISU NEW HUMAN SUBJECTS REVIEW FORM FEB 25 2009

SECTION I: GENERAL INFORMATION

Principal Investigator (PI): Vikram Swaroop Chandra, Koundinya		Phone: 515-294-4875	Fax: 515-294-0530
Degrees: MS	Correspondence Address: 206 C Curtiss Hall, ISU		
Department: Agricultural Education and Studies	Email Address: vikram@iastate.edu		
Center/Institute: Iowa State University, Ames, IA	College: College of Agriculture and Life Sciences		
PI Level: <input type="checkbox"/> Faculty <input type="checkbox"/> Staff <input type="checkbox"/> Postdoctoral <input checked="" type="checkbox"/> Graduate Student <input type="checkbox"/> Undergraduate Student			
Alternate Contact Person: Dr. Robert A. Martin		Email Address: drmartin@iastate.edu	
Correspondence Address: 201 Curtiss Hall, ISU, Ames, IA		Phone: 515-294-0896	
Title of Project: An analysis of the food safety educational processes in the Cooperative Extension System of the North Central Region of the United States			
Project Period (Include Start and End Date): [mm/dd/yy][February 01, 2009] to [mm/yy/dd][November 30, 2009]			

FOR STUDENT PROJECTS

Name of Major Professor/Supervising Faculty: Dr. Robert A. Martin		Signature of Major Professor/Supervising Faculty: <i>Robert A. Martin</i>	
Phone: 515-294-0896		Campus Address: 201 Curtiss Hall, ISU, Ames, IA	
Department: Agricultural Education and Studies		Email Address: drmartin@iastate.edu	
Type of Project: (check all that apply)			
<input type="checkbox"/> Research		<input type="checkbox"/> Thesis	
<input type="checkbox"/> Independent Study (490, 590, Honors project)		<input checked="" type="checkbox"/> Dissertation	
		<input type="checkbox"/> Class project	
<input type="checkbox"/> Other. Please specify: _____			

KEY PERSONNEL

List all members and relevant experience of the project personnel. This information is intended to inform the committee of the training and background related to the specific procedures that each person will perform on the project.

NAME & DEGREE(S)	SPECIFIC DUTIES ON PROJECT	TRAINING & EXPERIENCE RELATED TO PROCEDURES PERFORMED, DATE OF TRAINING
✓ Vikram Swaroop Chandra, Koundinya. M.Sc., (Ag.)	Write Proposal, develop the questionnaire, collect and analyze data, write dissertation, and publish results.	Fall 2006 <i>9/21/06</i>
✓ Dr. Robert A. Martin, Ph.D	Supervise the entire research process	July 2000 <i>7/20/00</i>
✓ Dr. Gaylan G. Scofield, Ph.D	Web-based survey development, development of electronic communications with subjects, and exporting data from the web into a spreadsheet for analysis	2000. <i>3/10/02</i>

Registration for Select Agents, High Consequence Livestock Pathogens and Toxins or Listed Plant Pathogens, or a Material Transfer Agreement (MTA) [EHS Website](#)

Yes No Does this project involve human research participants?

Yes No Does this project involve laboratory chemicals, human cell lines or tissue culture (primary OR immortalized), or human blood components, body fluid or tissues?

ASSURANCE

- I certify that the information provided in this application is complete and accurate and consistent with any proposal(s) submitted to external funding agencies.
- I agree to provide proper surveillance of this project to ensure that the rights and welfare of the human subject or welfare of animal subjects are protected. I will report any problems to the appropriate assurance review committee(s).
- I agree that I will not begin this project until receipt of official approval from all appropriate committee(s).
- I agree that modifications to the originally approved project will not take place without prior review and approval by the appropriate committee(s), and that all activities will be performed in accordance with all applicable federal, state, local and Iowa State University policies.

CONFLICT OF INTEREST

A conflict of interest can be defined as a set of conditions in which an investigator's or key personnel's judgment regarding a project (including human or animal subject welfare, integrity of the research) may be influenced by a secondary interest (e.g., the proposed project and/or a relationship with the sponsor). ISU's Conflict of Interest Policy requires that investigators and key personnel disclose any significant financial interests or relationships that may present an actual or potential conflict of interest. By signing this form below, you are certifying that all members of the research team, including yourself, have read and understand ISU's Conflict of Interest policy as addressed by the ISU Faculty Handbook (<http://www.provost.iastate.edu/faculty>) and have made all required disclosures.

Yes No Do you or any member of your research team have an actual or potential conflict of interest?
 Yes No If yes, have the appropriate disclosure form(s) been completed?

SIGNATURES

Vikram G. Chandra 2/25/09
Signature of Principal Investigator Date

Robert A. Martin 2/25/09
Signature of Department Chair Date

Major Professor/Supervising Faculty: Please sign cover page.

PLEASE NOTE: Any changes to an approved protocol must be submitted to the appropriate committee(s) before the changes may be implemented.

PART J: CONFIDENTIALITY

- 26. Describe below the methods that will be used to ensure the confidentiality of data obtained. (For example, who has access to the data, where the data will be stored, security measures for web-based surveys and computer storage, how long data or specimens will be retained, etc.)

Only the researchers will have access to the data. The names of the participants will not be identified against the data and the data will be deleted after publishing the results.

PART K: REGISTRY PROJECTS

To be considered a registry: (1) the individuals must have a common condition or demonstrate common responses to questions; (2) the individuals in the registry might be contacted in the future; and (3) the names/data of the individuals in the registry might be used by investigators other than the one maintaining the registry.

Yes No Does this project establish a registry?

If "yes," please provide the registry name below.

Checklist for Attachments

Listed below are the types of documents that should be submitted for IRB review. Please check and attach the documents that are applicable for your study:

- A copy of the informed consent document **OR** Letter of introduction containing the elements of consent
- A copy of the assent form if minors will be enrolled
- Letter of approval from cooperating organizations or institutions allowing you to conduct research at their facility
- Data-gathering instruments (including surveys)
- Recruitment fliers, phone scripts, or any other documents or materials participants will see or hear

The original signed copy of the application form and one set of accompanying materials should be submitted for review. **Federal regulations require that one copy of the grant application or proposal be submitted for comparison with the application for approval.**

FOR IRB USE ONLY:

Initial action by the Institutional Review Board (IRB):

- Project approved. Date: _____
- Pending further review. Date: _____
- Project not approved. Date: _____

Follow-up action by the IRB:

Diane K. Amert
IRB Approval Signature

19 March 2009
Date

**APPENDIX B. INSTITUTIONAL REVIEW BOARD APPROVAL MODIFICATION
FORM**

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Institutional Review Board
Office of Research Assurances
Vice President for Research
1138 Pearson Hall
Ames, Iowa 50011-2207
515 294-4566
FAX 515 294-4267

DATE: April 17, 2009

TO: Vikram Koundinya
206C Curtiss Hall

CC: Dr. Robert A. Martin
201 Curtiss Hall

FROM: Jan Canny, IRB Administrator
Office of Research Assurances

TITLE: An analysis of the food safety educational processes in the Cooperative Extension System of the North Central Region of the United States

IRB ID: 09-114 **Study Review Date:** 17 April 2009

The Institutional Review Board (IRB) Chair has reviewed the modification of this project and has declared the study remains exempt from the requirements of the human subject protections regulations as described in 45 CFR 46.101(b). The IRB determination of exemption means that:

- **You do not need to submit an application for annual continuing review.**
- **You must carry out the research as proposed in the IRB application**, including obtaining and documenting (signed) informed consent if you have stated in your application that you will do so or if required by the IRB.
- **Any modification of this research should be submitted to the IRB on a Continuing Review and/or Modification form, prior to making any changes**, to determine if the project still meets the Federal criteria for exemption. If it is determined that exemption is no longer warranted, then an IRB proposal will need to be submitted and approved before proceeding with data collection.

Please be sure to **use the documents with the IRB approval stamp** in your research.

Please note that you must submit all research involving human participants for review by the IRB. **Only the IRB may make the determination of exemption**, even if you conduct a study in the future that is exactly like this study.

For IRB Use Only	Modification Approval Date <u>April 17, 2009</u>	IRB MAR 24 2009
	Continuing Review Approval Date _____	
	Approval Expiration Date: <u>n/a</u>	

ISU HUMAN SUBJECTS CONTINUING REVIEW AND/OR MODIFICATION FORM

TYPE OF SUBMISSION: Continuing Review Modification ^{ib} Continuing Review and Modification

Principal Investigator: Vikram Swaroop Chandra, Koundinya	Phone: 515-294-4875
Degree: MS	Correspondence Address: 206 C Curtiss Hall, ISU
Department: Agricultural Education and Studies	E-mail Address: vikram@iastate.edu
Project Title: An analysis of the food safety educational processes in the Cooperative Extension System of the North Central Region of the United States	
IRB ID: 09-114	Date of Last Continuing Review: 18 March 2009
IF STUDENT PROJECT	
Name of Major Professor: Dr. Robert A. Martin	Phone: 515-294-0896
Department: Agricultural Education and Studies	Campus Address: 201 Curtiss Hall, ISU, Ames, IA
	E-mail Address: drmartin@iastate.edu

ORIGINAL

FUNDING INFORMATION:

<input type="checkbox"/> External Grant/Contract	<input checked="" type="checkbox"/> Internal Support (no specific funding source) or Internal Grant (indicate name below)
Name of Funding Source:	OSPA Record ID on Gold Sheet:
<input type="checkbox"/> Part of Training, Center, Program Project Grant – Director:	Overall IRB ID No:
<input checked="" type="checkbox"/> Student Project—No funding or funding provided by student	<u>—various internal funds</u>

CONFLICT OF INTEREST

The proposed project or relationship with the sponsor require the disclosure of significant financial interests that present an actual or potential conflict of interest for investigators involved with this project. By signing this form, all investigators certify that they have read and understand ISU's Conflict of Interest policy as addressed by the ISU Faculty Handbook and made all disclosures required by it. (<http://www.provost.iastate.edu/faculty>)

Do you or any member of your research team have a conflict of interest? Yes No
If yes, has the appropriate disclosure form been completed? Yes No

ASSURANCE

I certify that the information provided in this application is complete and accurate and consistent with proposal(s) submitted to external funding agencies. I agree to provide proper surveillance of this project to insure that the rights and welfare of the human subjects are protected. I will report any adverse reactions to the IRB for review. I agree that modifications to the originally approved project will not take place without prior review and approval by the Institutional Review Board, and that all activities will be performed in accordance with state and federal regulations and the Iowa State University Federal Wide Assurance.

Vikram Swaroop Chandra 3/24/09
Signature of Principal Investigator Date

Student Projects: Faculty signature indicates that this application has been reviewed and is recommended for IRB review.

Robert A. Martin 3/24/09 Kerry A. Amittel April 17, 2009
Signature of Supervising Faculty Date IRB Approval Signature Date

For IRB Use Only	EXPEDITED per 45 CFR 46.110(b) _____, Category _____, Letter _____
	STUDY REMAINS EXEMPT per 45 CFR 46.101(b) <u>1, 2</u>
	WAIVER of SIGNED CONSENT per 45 CFR 46.117(c) _____
	WAIVER of ELEMENTS of Consent per 45 CFR 46.116 _____
	VULNERABLE POPULATION per 45 CFR 46. _____

SECTION III: PROPOSED MODIFICATIONS OR CHANGES

If this application is to request approval for modification or changes to your project, please complete Section I: Key Personnel and Section III.

The submission of a modification form is required whenever changes are made to an approved project. This includes but is not limited to a title change, changes in investigators, resubmission of a grant proposal involving changes to the original proposal, changes in the funding source, changes of an instrument, advertisements, reports from a data safety and monitoring board, addition of a test instrument, etc. **NOTE: All changes must be submitted and approved by the IRB prior to their implementation, unless the change is necessary to protect the safety of participants.**

1. Does your project require approval from another institution, please attach letters of approval?

Yes No

2. The following modification(s) are being made (check all that apply):

- Change in protocol.
 Change in type or total number of participants. New anticipated total: 900
 Change in informed consent document.
 Change in co-investigator(s). New co-PI name:

Signature of new Co-PI: _____

- Change in funding source/sponsor. Please attach copy of grant proposal sent to new funding agency.
 Other (e.g., change in project title, adding new materials, adding advertisement, etc.)

NOTE: If the change involves a new Principal Investigator, a new Human Subjects Review form must be submitted.

3. Describe the modification(s) indicated above in sufficient detail for evaluation independent of any other documents. When submitting revised documents please submit one clean copy of the new document and a copy with the changes highlighted.

It was initially intended that a census will be conducted. Now, we will be taking a random sample of the population. Also, previously we wanted to survey the extension educators in the program areas of Agricultural and Natural Resources and Families, but we are now adding County Extension Directors also to the population from which a random sample will be drawn.

APPENDIX C. INFORMED CONSENT AND INTRODUCTION LETTER

February XX, 2009

Dear Extension educator,

Food borne illnesses are one of the major concerns in the United States. Food safety has emerged as an important issue which needs constant attention and no country is exempt from food safety risks. In this context food safety education assumes utmost significance. Extension educators are positioned uniquely to educate the general public on food safety issues so they become informed consumers of safe foods.

The purpose of this study is to analyze extension educators' perceptions regarding food safety and the educational processes used in conducting educational programs on this topic. This study will also collect some demographic information and suggestions for improving the use of the educational processes. As of now, very little information is available on the food safety educational processes. We are collecting information from all the extension educators in the program areas of Agricultural and Natural Resources and Families in the North Central Region of the United States. We hope to identify important information relative to the perceptions on food safety and food safety related educational processes, the teaching methods and tools you currently use in educating clients about food safety, and some demographic information.

We are collecting data through an electronic survey that will come to you via an e-mail. You are assured that your responses will be held in confidence and used only for statistical analysis. Since we are interested in group data, code numbers assigned to the e-survey questionnaire will be used only to identify the non-respondents so they can be requested to return their surveys. The code numbers will be removed upon the receipt of the questionnaire. Please consider your participation in this study as voluntary and you are welcome to withdraw your participation at any moment during the study. Furthermore, you can skip any questions that you do not feel comfortable answering.

All questionnaires will be deleted after the data has been recorded and analyzed. Data from this study will be used to write a PhD dissertation and share with other professionals in Agricultural and Extension Education. Your help in conducting this survey is therefore essential. The questionnaire will take about 10 minutes to complete. Please complete and return the questionnaire by following the directions given in the e-mail.

We greatly appreciate your participation in the study.

Sincerely,

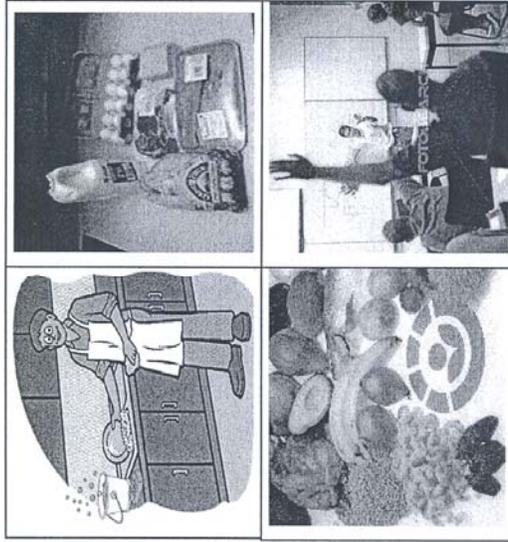
Vikram Koundinya,
Graduate Research Assistant

Robert Martin,
Department Chair & Supervising Faculty

APPENDIX D. APPROVED SURVEY QUESTIONNAIRE

ISU IRB # 1 09-114
Expiry Date: 18 March 2009
Initial by: JC

**AN ANALYSIS OF THE FOOD SAFETY EDUCATIONAL PROCESSES IN
THE COOPERATIVE EXTENSION SYSTEM OF THE
NORTH CENTRAL REGION OF THE UNITED STATES**



Definition of Food Safety Education

The educational processes that foster "Protecting the food supply from microbial, chemical (i.e. rancidity, browning) and physical (i.e. drying out, infestation) hazards or contamination that may occur during all stages of food production and handling-growing, harvesting, processing, transporting, preparing, distributing and storing" (Rhode Island Food Safety Education, Cooperative Extension, 2000).

Department of Agricultural Education and Studies
IOWA STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY

I. GENERAL PERCEPTIONS ABOUT FOOD SAFETY

To what extent do you agree with the following statements about food safety? (PLEASE CHECK A NUMBER FOR EACH STATEMENT)

1 = Strongly Disagree (SD) 2 = Disagree (D) 3=Uncertain (U) 4 = Agree (A) 5 = Strongly Agree (SA)

STATEMENT	SCALE				
	SD	D	U	A	SA
Food safety is an ambiguous term to me.	1	2	3	4	5
Food safety includes many different aspects from farm to fork.	1	2	3	4	5
Improper operations on the farm do not affect food safety.	1	2	3	4	5
Pesticide residues affect food safety.	1	2	3	4	5
Irradiation is a technology that ensures food safety.	1	2	3	4	5
Irradiation deteriorates quality of food.	1	2	3	4	5
Irradiation makes food radioactive.	1	2	3	4	5
Freezing foods to prescribed temperatures kills bacteria.	1	2	3	4	5
I am willing to pay extra for irradiated food.	1	2	3	4	5
Most food related problems occur as a result of human error.	1	2	3	4	5

II. FOOD SAFETY EDUCATIONAL PROCESSES

Given below are the components of an educational process. Please indicate the importance of each item and the extent to which you use each in a typical food safety education program.

Column A represents the **Perceived Importance**: 1=Not Important (NI), 2=Of little importance (LI), 3=Somewhat Important (SI), 4=Important (I), 5=Highly Important (HI). **Column B** represents the **Extent of use**: 1=Not Used (NU), 2=Rarely Used (RU), 3=Sometimes used (SU), 4=Frequently Used (FU), 5=Always Used (AU).

Please check the appropriate number in columns A & B.

A					EDUCATIONAL PROCESS	B				
PERCEIVED IMPORTANCE						EXTENT OF USE				
NI	LI	SI	I	HI		NU	RU	SU	FU	AU
1	2	3	4	5	Conducting needs assessment	1	2	3	4	5
1	2	3	4	5	Stating objectives of the program	1	2	3	4	5
1	2	3	4	5	Using a variety of teaching methods	1	2	3	4	5
1	2	3	4	5	Revising content to incorporate recent research	1	2	3	4	5
1	2	3	4	5	Using program evaluation feedback in designing future programs	1	2	3	4	5
1	2	3	4	5	Revising teaching strategies based on research about "how learning occurs"	1	2	3	4	5
1	2	3	4	5	Possessing knowledge about how adults learn	1	2	3	4	5
1	2	3	4	5	Involving clients in planning educational programs	1	2	3	4	5

ISU PNG # 1 09-114
 Exempt Date: 18 March 2009
 Initial By: jc

III. PERCEIVED INSERVICE NEEDS

Please indicate your perceived need for more education in following components related to the food safety educational processes.

1=None (N) 2=Low Need (LN) 3=Some Need (SN) 4=High Need (HN) 5= Very High Need (VHN)

STATEMENT	SCALE				
	N	LN	SN	HN	VHN
Needs assessment (e.g: different methods of assessing needs)	1	2	3	4	5
Program planning (e.g: participatory approach, developing a plan of action, writing reports)	1	2	3	4	5
Learning systems (e.g: Learning styles, principles of learning)	1	2	3	4	5
Delivery systems (e.g: using teaching tools, different delivery techniques, developing instructional materials)	1	2	3	4	5
Evaluation systems (e.g: different evaluation methodologies, developing survey instruments)	1	2	3	4	5
ANY OTHERS, PLEASE INDICATE:					
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5

V. TEACHING TOOLS

The following is the list of teaching tools. Please indicate the effectiveness of each tool and the extent to which you use each tool.

Column A represents your **Perceived Effectiveness**: 1=Not effective (NE), 2=Of little effectiveness (LE), 3=Somewhat effective (SE), 4=Effective (E), 5=Very effective (VE). **Column B** represents the **Extent of use**: 1=Not used (NU), 2=Rarely used (RU), 3=Sometimes used (SU), 4=Frequently used (FU), 5=Always used (AU). Please check the appropriate number in columns A & B.

A						B				
PERCEIVED EFFECTIVENESS						EXTENT OF USE				
NE	LE	SE	E	VE	TEACHING TOOLS	NU	RU	SU	FU	AU
1	2	3	4	5	MS® PowerPoint	1	2	3	4	5
1	2	3	4	5	Blackboard/WebCt	1	2	3	4	5
1	2	3	4	5	Interactive Whiteboard	1	2	3	4	5
1	2	3	4	5	Posters	1	2	3	4	5
1	2	3	4	5	Charts	1	2	3	4	5
1	2	3	4	5	Internet/websites	1	2	3	4	5
1	2	3	4	5	Videotapes	1	2	3	4	5
1	2	3	4	5	Compact Discs	1	2	3	4	5
1	2	3	4	5	Pamphlets	1	2	3	4	5
1	2	3	4	5	Brochures	1	2	3	4	5
1	2	3	4	5	Text Books	1	2	3	4	5
1	2	3	4	5	Research Publications	1	2	3	4	5
1	2	3	4	5	Podcasts	1	2	3	4	5
1	2	3	4	5	Newsletters	1	2	3	4	5
					<i>Any others, please list below</i>					
1	2	3	4	5		1	2	3	4	5
1	2	3	4	5		1	2	3	4	5

VI. Demographics

Please furnish the following demographic information as it relates to you (PLEASE WRITE IN THE BLANKS).

1. Work experience in Extension: _____ (Completed years)
2. Gender: 1. MALE 2. FEMALE
3. Age: _____
4. Highest academic degree earned (Please circle one)
1. BS 2. MS 3. Ph.D 4. OTHERS, PLEASE INDICATE _____
5. Program area in which you work: _____

VI. What suggestions do you have for improving food safety educational processes? Also, please provide comments regarding this survey. (PLEASE TYPE BELOW).

Thank you very much for your time and efforts. Your cooperation is greatly appreciated. For any further questions please contact: *Vikram Koundinya*, Graduate Assistant and *Dr. Robert A. Martin*, Chair & Professor, Dept of Agricultural Education and Studies, ISU, Ames, IA – 50010. Ph#: 515-294-4875. E-mail address: vikram@iastate.edu

APPENDIX E. FOLLOW-UP LETTER

ISU IRB # 1	09-114
EXEMPT DATE:	18 March 2009
Initial By:	jc

February XX, 2009

Dear Extension educator,

We are conducting a survey to analyze extension educators' perceptions regarding food safety and the educational processes used in conducting educational programs on this topic. Recently, a questionnaire was sent to you via email. We haven't yet received your responses to the questionnaire. Your participation in this study is very important to us.

If you have already completed and submitted the questionnaire to us prior to receiving this e-mail, please accept our sincere thanks. Otherwise, please complete the questionnaire and submit it. Alternatively, if you did not receive the questionnaire through e-mail, or if it was accidentally deleted, please send a message via email to Vikram Koundinya at vikram@iastate.edu or call (515) 294-4875 and we will send you another questionnaire.

Your assistance is greatly appreciated.

Sincerely,

Vikram Koundinya,
Graduate Research Assistant

Robert Martin,
Department Chair & Supervising Faculty

REFERENCES

- AGCareers.com (2010). Iowa State University. Retrieved July 21, 2010, from <http://www.agcareers.com/educationaladv.cfm?task=IowaStateUniversity>
- Agresti, A. & Finlay, B. (2008). *Statistical methods for the social sciences* (4th ed). Upper Saddle River, NJ: Prentice Hall.
- Ajzen, I. (2006). *Theory of planned behavior*. Retrieved from University of Massachusetts Amherst Web site: <http://people.umass.edu/aizen/tpb.html>
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179-211. doi: 10.1016/0749-5978(91)90020-T
- Akbari, M., & Asadi, A. (2008). A comparative study of Iranian consumers' versus extension experts' attitudes towards agricultural organic products (aop). *American Journal of Agricultural and Biological Sciences*, 3(3), 551-558.
- Allison, R. (1990). Overcoming obstacles to needs assessment [Abstract]. *Training*, 27(3), 36-41. (ERIC Journal Reproduction Service No. EJ 403 447)
- Altekruse, S. F., Steet, D. A., Fein, S. B., & Levy, A. S. (1995). Consumer knowledge of foodborne microbial hazards and food-handling practices. *Journal of Food Protection*, 59(3), 287-294.
- Andrews, M. (1983). Evaluation: An essential process. *Journal of Extension*, September/October. 8-13.
- Apps, J. W. (1985). *Improving practice in continuing education. Modern approaches for understanding the field and determining priorities*. Jossey-Bass Inc., Publishers, 433 California Street, San Francisco, California 94104.
- Armstrong, D. M. (1988). Perception and belief. In Dancy, J (Eds.). *Perceptual knowledge*. Oxford University press, New York.
- Ary, D., Jacobs, L. C., Razavieh, A., & Sorenson, C. (2006). *Introduction to research in education* (7th ed). Thomson Wadsworth, Thomas Higher Education, 10 Davis Drive, Belmont, CA 94002-3098, USA.
- Asadi, A., Akbari, M., Sharifzadeh, A., & Hashemi, S. M. (2009). Analysis of factors affecting agricultural organic products diffusion among consumers: Perception of extension workers. *World Applied Sciences Journal*, 6(3), 331-338.
- Association of Public and Land-Grant Universities (2009). Smith-Lever. Appropriations Request, National Institute of Food and Agriculture. Retrieved from <http://www.land-grant.org/docs/FY2010/KB/smith-lever.pdf>
- Bailey, S. J., & Deen, M. Y. (2002). A framework for introducing program evaluation to extension faculty and staff. *Journal of Extension*, 40(2), Article number 2IAW1.

- Bargh, J. A., Chen, M., & Burrows, L. (1996). Automaticity of social behavior: Direct effects of trait construct and stereotype activation on action. *Journal of Personality and Social Psychology*, 71(2), 230-244.
- Barkman, S. (1991). Higher impact instructional videos, *Journal of Extension*, 29(1), Article number 1FEA4.
- Barton, J. A., & Barbeau, W. E. (1992). Is Extension ready for food safety education in the '90s?. *Journal of Extension*, 30(1), Article number 1FRM2.
- Baruch, Y. (1999). Response rate in academic studies – A comparative analysis. *Human Relations*, 52(4), 421-438.
- Bednar, C., Kwon, J., Baker, M., & Kennon, L. (2003). Survey of food safety education needs for low-income consumers. *Journal of the American Dietetic Association*, 103(9), pp 111-112.
- Berger, N. O., Caffarella, R. S., & O'Donnell, J. M. (2004). "Learning contracts". In Galbraith, M. W (eds.), *Adult learning methods. A guide for effective instruction* (3rd Ed) (pp. 289-319). Krieger publishing company, Malabar, Florida. 32950.
- Blackburn, D. A. (1999). Ag science fairs: The next wave in agricultural literacy. *Journal of Extension*, 37(4), Article number 4TOT1.
- Bolman, L. G., & Deal, T. E. (1991). *Reframing organizations. Artistry, choice and leadership*. Jossey-Bass Inc., Publishers, 350 Sansome Street, San Francisco, California 94104.
- Boone, H. N., Gartin, S. A., Wright, C. B., Lawrence, L. D. & Odell, K. S. (2002). Adult education philosophies practiced by agricultural education teachers in Pennsylvania, Virginia, and West Virginia. *Journal of Agricultural Education*, 43(3), 37–48.
- Boyd, R. D., & Apps, J. W. (1980). "A conceptual model for adult education". In Boyd, R.D., Apps, J. W. and Associates (eds.). *Redefining the discipline of adult education* (pp.1-13). Adult Education Association of the United States of America, 810 Eighteenth Street, N. W., Washington, D. C. 20006.
- Braiser, K., Barbercheck, M., Kiernan, N. E., Sachs, C., Schwartzberg, A., & Trauger, A. (2009). Extension educators' perceptions of the educational needs of women farmers in Pennsylvania. *Journal of Extension*, 47(3). Article number 3FEA9.
- Braverman, M. T., & Engle, M. (2009). Theory and rigor in extension program evaluation planning. *Journal of Extension*, 47(3). Article number 3FEA1.
- Brewer, N. T., Weinstein, N. D., Cuite, C. L., & Herrington, J. E. (2004). Risk perceptions and their relation to risk behavior. *Annals of Behavioral Medicine*, 27(2), 125-130. doi: 10.1207/s15324796abm2702_7

- Brookfield, S. D. (2004). "Discussion". In Galbraith, M. W. (eds.), *Adult learning methods. A guide for effective instruction* (3rd Ed) (pp. 209-226). Krieger publishing company, Malabar, Florida. 32950.
- Brown, A. S., Gibson, J. D., & Stewart, D. L. (2008). An assessment of Virginia cooperative extension's new extension agent training program. *Journal of Extension*, 46(4), Article number 4FEA7.
- Bruening, T., & Martin, R. A. (1992). Farmer perceptions of soil and water conservation issues: Implications to agricultural and extension education. *Journal of Agricultural Education*, 48-54.
- Buzby, J. C. (2003). *International trade and food safety: Economic theory and case studies*. Agricultural Economic Report No. 828, USDA.
- Buzby, J. C. (2001). *Effects of Food-Safety Perceptions on Food Demand and Global Trade*. Changing Structure of Global Food Consumption and Trade / WRS-01-1. Economic Research Service/USDA. P 55-66. Retrieved from <http://www.ers.usda.gov/publications/wrs011/wrs011i.pdf>
- Caffarella, R. S. (2002). *Planning programs for adult learners. A practical guide for educators, trainers, and staff developers* (2nd ed). Jossey-Bass, A Wiley Company, 989 Market Street, San Fransisco, CA 94103-1741.
- California Department of Education (2005). *Agricultural literacy and awareness*. Retrieved July 30, 2008, from http://www.calaged.org/cde/aged_lit.htm
- Camara, M. (2006). *Agricultural extension educators' perceptions regarding the teaching and learning process related to water quality issues in the North Central Region of the United States* (Doctoral Dissertation). Iowa State University, Ames.
- Caravella, J. (2006). A needs assessment method for extension educators. *Journal of Extension*, 44(1), Article number 1TOT2.
- Cartwright, M. A. (1945). The history of adult education in the United States. *Journal of Negro Education*. 14(3), 283-292.
- Cecil, K., & Feltes, D. (2002). Distance education – A case study in practical application. *Journal of Extension*, 40(5), Article number 5TOT4.
- Centers for Disease Control and Prevention (2007). *Foodborne illness. Frequently asked questions*. Department of Health and Human Services. Retrieved from http://www.cdc.gov/ncidod/dbmd/diseaseinfo/foodborneinfections_g.htm#howmanyases
- Chapman-Novakofski, K., Boeckner, L. S., Canton, R., Clark, C. D., Keim, K., Britten, P., & McClelland, J. (1997). Evaluating evaluation – What we've learned. *Journal of Extension*, 35(1), Article number 1RIB2.

- Chartrand, T. L., & Bargh, J. A. (1999). The chameleon effect: The perception-behavior link and social interaction. *Journal of Personality and Social Psychology*, 76(6), 893-910.
- Chen, M., & Bargh, J. A. (1997). Nonconscious behavioral confirmation processes: The self-fulfilling consequences of automatic stereotype activation. *Journal of Experimental Social Psychology*, 33, 541-560. Article number JS971329.
- Chizari, M., Lindner, J. R., & Zoghie, M. (1999). Perceptions of extension agents' educational needs regarding sustainable agriculture in Khorasan province, Iran. *Journal of Agricultural Education*, 40(4), 20-27.
- Chizari, M., Karbasioun, M., & Lindner, J. R. (1998). Obstacles facing extension agents in the development and delivery of extension educational programs for adult farmers in the province of Esfahan, Iran. *Journal of Agricultural Education*, 39(1), 48-54.
- Christensen, J., Warnick, B. K., Spielmaker, D., Tarpley, R. S., & Straquadine, G. S. (2006 April). *Agricultural inservice needs of technology, life and careers teachers*. Paper presented at the 25th Western Region Agricultural Education Conference, Boise, ID. Retrieved from http://www.agclassroom.org/consortium/pdf/ag_literacy/2006/ag_inservice.doc
- Conklin, N. L., Hook, L. L., Kelbaugh, B. J., & Nieto, R. D. (2002). Examining a professional development system: a comprehensive needs assessment approach. *Journal of Extension*, 40(5), Article number 5FEA1.
- Cole, J. M. (1981). Selecting extension teaching methods. *Journal of Extension*, 27-32.
- Conti, G. J., & Kolody, R. C. (2004). "Guidelines for selecting methods and techniques". In Galbraith, M. W. (eds.), *Adult learning methods. A guide for effective instruction* (3rd Ed) (pp. 181-192). Krieger publishing company, Malabar, Florida. 32950.
- Connors, J. J., Swan, B., & Brousseau, J. A. (2004). Perceptions of Lithuanian agriculture teachers towards the ecological paradigm. Proceedings of the 20th Association of International Agricultural and Extension Education conference, Dublin, Ireland, 506-518.
- Cooper, M. K., & Henschke, J. A. (2001). *Andragogy: Its research value for practice*. Paper presented at the Midwest Research-to-Practice Conference. Eastern Illinois University, Charleston, Illinois, September 26-28, 2001.
- Costello, C., Gaddis, T., Tamplin, M., & Morris, W. (1997). Evaluating the effectiveness of two instructional techniques for teaching food safety principles to quick service employees. *Journal of Foodservice Systems*, 10, 41-50.
- Cranton, P. (2006). *Understanding and promoting transformative learning. A guide for educators of adults* (2nd ed). Jossey-Bass Inc., Publishers, 350 Sansome Street, San Fransisco, California 94104.

- Creswell, J. L. (1990). *An identification and assessment of Extension educational delivery systems for training of private pesticide applicators* (Doctoral Dissertation). Iowa State University, Ames.
- Dale, E. (1969). *Audiovisual Methods in Teaching* (3rd Ed). The Drydenpress, Holt, Rinehart and Winston, Inc. Chicago.
- Davenport, J. III (1987). *A way out of the andragogy morass* (Abstract). Paper presented at the Conference of the Georgia Adult Education Association, Savannah, GA. (ERIC Journal Reproduction Service No. ED 283 989).
- Davenport, J., & Davenport, J. A. (1985). A chronology and analysis of the andragogy debate. *Adult Education Quarterly*, 35(3), 152-159.
- Davis, G. A. (2006). Learning style and personality type preferences of community development extension educators. *Journal of Agricultural Education*, 47(1), 90-99.
- Day, P., Latham, M., & Leigh, G. K. (2004). Family violence education in public waiting rooms. *Journal of Extension*, 42(5), Article number 5RIB7.
- Dean, K. W., Reames, E. S., Tuuri, G., Keenan, M. J., Bankston Jr, J. D., Friendship, D. Y., ... Tucker, E. H. (2008). Improved knowledge and adoption of recommended food safety practices by food recovery agency personnel and volunteers participating in the serving food safely program. *Journal of Extension*, 46(4), Article number 4RIB4.
- De Crow, R. (1968). Adult education in the United States [Abstract]. *Education+Training*, 10(5), 186-198. doi: 10.1108/eb015962.
- DeRuiter, F. E., & Dwyer, J. (2002). Consumer acceptance of irradiated food: dawn of a new era? *Food Service Technology*, 2, 47-58.
- De Waal, C. S., & Robert, N. (2005). *Global and local: Food safety around the world*. Center for Science in the Public Interest, 1875 Connecticut Avenue, N.W., Suite 300, Washington, D. C. 20009-5728.
- Dijksterhuis, A., & Bargh, J. A. (2001). The perception-behavior expressway: Automatic effects of social perception on social behavior. *Advances in Experimental Social Psychology*. 33, 1-40.
- Dijksterhuis, A., & van Knippenberg, A. (1998). The relation between perception and behavior, or how to win a game of trivial pursuit. *Journal of Personality and Social Psychology*, 74(4), 865-877.
- Dillman, D. A. (2007). *Mail and internet surveys. The tailored design method* (2nd ed.). 2007 update with new internet, visual and mixed-mode guide. John Wiley & Sons, Inc., Hoboken, New Jersey.

- Dillman, D. A., Smyth, J. D., & Christian, L. M. (2009). *Internet, mail and mixed-mode surveys: The tailored design method* (3rd ed.). Hoboken, NJ: Wiley and Sons.
- Dollisso, A. D., & Martin, R. A. (2001). Perceptions regarding preferred educational information sources by farmers: Implications to international agricultural extension education. Proceedings of the 20th Association of International Agricultural and Extension Education conference, Baton Rouge, Louisiana, April 4-7, 2001.
- Dooley, K. E., Van Laanen, P. G., & Fletcher, R. D. (1999). Food safety instructor training using distance education. *Journal of Extension*, 37(3), Article number 3FEA5.
- Dooley, L. M., & Lindner, J. R. (2003). The handling of nonresponse error. *Human Resource Development Quarterly*, 14(1), 99-110. doi: 10.1002/hrdq.1052
- Draves, W. A. (1997). *How to teach adults* (2nd ed). The Learning Resources Network (LERN), P. O. Box 1448, Manhattan, Kansas 66505.
- Egri, C. P. (1999). Attitudes, backgrounds and information preferences of Canadian organic and conventional farmers: Implications for organic farming advocacy and extension. *Journal of Sustainable Agriculture*, 13(3), 45- 72.
- Elias, J. L., & Merriam, S. (1980). *Philosophical foundations of adult education*. Robert E. Krieger publishing company. Malabar, Florida – 32950.
- Elliott, M. (1999). Classifying family life education on the World Wide Web. *Family Relations*, 48(1), 7-13.
- Ellis, J. D. (2006). *Food safety training as adult education: Determining prior knowledge in the service of scientific conceptual change* (Doctoral Dissertation). Iowa State University, Ames.
- Etling, A. (1995). Needs assessment: A handbook. *Journal of Extension*, 33(1). Article number 1TOT1.
- Farrah, S. J. (2004). "Lecture". In Galbraith, M. W (eds.), *Adult learning methods. A guide for effective instruction* (3rd Ed) (pp. 227-252). Krieger publishing company, Malabar, Florida. 32950.
- Ferguson, M. J., & Bargh, J. A. (2004). How social perceptions can automatically influence behavior. *TRENDS in Cognitive Sciences*. 8(1), 33-39. doi:10.1016/j.tics.2003.11.004
- Fitzpatrick, J. L., Sanders, J. R., & Worthen, B. R. (2004). *Program evaluation. Alternative approaches and practical guidelines* (3rd ed.). Pearson Education Inc., 75 Arlington Street, Boston, MA 02116.
- Fiske, E. P. (1989). From rolling stones to cornerstones: Anchoring land-grant education in the counties through the Smith-Lever Act of 1914. *Rural Sociologist*, Fall 1989, 7-14.

- Food and Agricultural Organization (2004). *Foodborne diseases: Situation of diarrheal diseases in Thailand*. Proceedings of FAO/WHO Regional Conference on Food Safety for Asia and the Pacific, Seremban, Malaysia, 24-27 May.
- Food Safety Asia (2010). *Concept*. Retrieved July 30, 2010 from <http://www.foodsafetyasia.com/home.asp>
- Foster, B. (2001). *Women in agricultural education: Who are you?* Proceedings of 28th Annual National Agricultural Education Research Conference, December 12, 2001, 384-395.
- Ford, C. L. (1995). Educational priorities of small farmers in West Tennessee. *Journal of Agricultural Education*, 36(1), 31-37.
- Franz, N. (2007). Adult education theories: Informing Cooperative Extension's transformation. *Journal of Extension*, 45(1). Article number 1FEA1.
- Frenzen, P. D., Majchrowicz, A., Buzby, J. C., & Imhoff, B. (2000). *Consumer acceptance of irradiated meat and poultry products*. Issues in Food Safety Economics, ERS USDA, Agriculture Information Bulletin No. 757/August 2000, 1-8.
- Galbraith, M. W. (2004). *Adult learning methods: A guide for effective instruction* (3rd ed.). Krieger publishing company, Malabar, Florida. 32950.
- Garton, B. L. (1999). "Adult teaching methods". In Birkenholz, R. J (eds.). *Effective adult learning* (pp. 43-56). Interstate Publishers, Inc. Danville, Illinois. 510 North Vermilion Street, P.O. Box 50, Danville, IL 61834-0050.
- Gentry-Van Laanen, P., & Nies, J. I. (1995). Evaluating Extension program effectiveness: Food safety education in Texas. *Journal of Extension*, 33(5). Article number 5FEA4.
- George, D., & Mallery, P. (2003). *SPSS for windows step by step. A simple guide and reference. 11.0 update* (4th ed). Pearson Education, Inc. New York, USA.
- Gibson, J. D., & Hillison, J. (1994). Training needs of area specialized extension agents. *Journal of Extension*, 32(3). Article number 3FEA3.
- Gilley, J. W. (2004). "Demonstration and simulation". In Galbraith, M. W. (eds.), *Adult learning methods. A guide for effective instruction* (3rd Ed) (pp. 361-381). Krieger publishing company, Malabar, Florida. 32950.
- Gilmore, G. D., Meehan-Strub, M., & Mormann, D. (1992). Community-based, food safety survey. *Journal of Extension*, 33(1), Article number 1RIB3.
- Gordon, J. C. (2002). Beyond knowledge: Guidelines for effective health promotion messages. *Journal of Extension*, 40(6), Article number 6FEA7.

- Graf, L. A., & Platen, A. M. (1985). Factors influencing perception: Gaining understanding through experience. *Developments in Business Simulation & Experiential Exercises*, 12, 150-156. Retrieved from <http://sbaweb.wayne.edu/~absel/bkl/vol12/12bm.pdf>
- Gregorc, A. F. (2005). *Mind styles™*. Retrieved from <http://facultyweb.cortland.edu/andersmd/learning/Gregorc.htm>
- Guion, L. A., Simonne, A., & Easton, J. (2004). Youth perspectives on food safety. *Journal of Extension*, 42(1), Article number 1RIB5.
- Hall, J. B., McKinnon, B. R., Greiner, S. P., & Whittier, W. D. (2004). Teaching complex, indepth programs. *Journal of Extension*, 42(3), Article number 3FEA2.
- Henschke, J. A., & Cooper, M. K. (n.d.). *International research foundation for andragogy and the implications for the practice of education with adults*. Retrieved August 2, 2010, from http://www.umsl.edu/continuingeducation/mwr2p06/pdfs/B/Henschke_Cooper_International_research_foundation.pdf
- Hentschel, U., Smith, G., & Draguns, J. G. (1986). The roots of perception. Individual differences in information processing within beyond awareness. *Advances in Psychology*, 38. Elsevier Science Publishing Company, Inc. 52 Vanderbilt Avenue, New York, N. Y. 10017, U.S.A.
- Holz-Clause, M. (2009). *Value-added agriculture producers: How they find, obtain, and validate knowledge inputs* (Doctoral Dissertation). Iowa State University, Ames.
- Hoover, T. & Connor, N. J. (2001). Preferred learning styles of Florida association for family and community education volunteers: Implications for professional development. *Journal of Extension*, 39(3), Article number 3FEA3.
- Iddings, R. K., & Apps, J. W. (1992). Learning preferences and farm computer use. *Journal of Extension*, 30(3), Article number 3FEA4.
- Iowa State Department of Public Health (2008 September). *What should you do if you think you have a food-related illness?* Iowa State Department of Public Health, Press Release – 9/22/08.
- Iowa State University Extension (2009). *Concept proposal: Global academy for extension practice*. SP 337 Revised August 2009.
- Iowa State University Extension (2010). Program areas. Retrieved from <http://www.extension.iastate.edu/programareas.htm>
- Israel, G. D. & Ingram, D. L. (1991). Videos for self-study, *Journal of Extension*, 29(4). Article number 4FEA6.
- Jarvis, P. (2004). *Adult education and lifelong learning. Theory and practice* (3rd ed.). RoutledgeFalmer, 270 Madison Ave, New York, NY 10016.

- Jayaratne, K. S. U. (2001). *Agricultural extension educators' perceptions regarding the teaching and learning processes as related to sustainable agriculture: Implications for agricultural extension education* (Doctoral Dissertation). Iowa State University, Ames.
- Jayaratne, K. S. U., Hanula, G., & Crawley, C. (2005). A simple method to evaluate series-type extension programs. *Journal of Extension*, 43(2), Article number 2TOT3.
- Jayaratne, K. S. U., Harrison, J. A., & Bales, D. W. (2009). Impact Evaluation of Food Safety Self-Study Extension Programs: Do Changes in Knowledge Relate to Changes in Behavior of Program Participants? *Journal of Extension*, 47(3), Article number 3RIB1.
- Jayaratne, K. S. U., Lyons, A. C., & Palmer, L. (2008). A user-friendly evaluation resource kit for extension agents delivering financial education programs. *Journal of Extension*, 46(1), Article number 1TOT3.
- Jayaratne, K.S.U & Martin, R. A. (2003). *Agricultural extension educators' perceptions regarding teaching methods and tools for educating farmers about sustainable agricultural practices*. Proceedings of AEEE central region agricultural education research conference, St Louis, Missouri.
- Jayaratne, K. S. U., Martin, R. A., & DeWitt, J. R. (2001). Perceptions regarding sustainable agriculture: Emerging trends for educating extension educators. Proceedings of the 20th Association of International Agricultural and Extension Education conference, Baton Rouge, Louisiana, April 4-7, 2001.
- Jenkins, J. H., Newman, M. E., Castellaw, J. C., & Lane, Jr, C. D. (2000). Partnering with the local livestock market in educational programs. *Journal of Extension*, 38(3), Article number 3RIB2.
- Johnson, S. B., Carter, H. S., & Kaufman, E. K. (2008). Learning styles of farmers and others involved with the Maine potato industry. *Journal of Extension*, 46(4). Article number 4RIB7.
- Kaferstein, F., & Abdussalam, M. (1999). Food safety in the 21st century. *Bulletin of the World Health Organization*, 77(4), 347-351.
- Kafarstein, F. K., Motarjemi, Y., & Bettcher, D. W. (1997). Foodborne disease control: A transitional challenge. *Emerging Infectious Diseases*, 3(4), 503-510.
- Kaiser, L., McMurdo, T., & Joy, A. B. (2007). The food stamp nutrition education program focuses on the learner. *Journal of Extension*, 45(2), Article number 2RIB5.
- Kelsey, K. D., Schnelle, M., & Bolin, P. (2005). Increasing educational impact: A multi-method model for evaluating extension workshops. *Journal of Extension*, 43(3), Article number 3FEA4.

- Kidd, J. R. (1973). *How adults learn*. Association Press, 291 Broadway, New York, N. Y. 10007.
- Knowles, M. S. (1990). *The adult learners. A neglected species* (4th ed). Gulf Publishing Company, Houston, U.S.A.
- Knowles, M. S. (1984). *The adult learners. A neglected species* (3rd ed). Gulf Publishing Company, Houston, U.S.A.
- Knowles, M. S., Holton III, E. F., & Swanson, R. A. (2005). *The adult learner. The definitive classic in adult education and human resource development* (6th ed). Elseiver, 30 Corporate Drive, 4th Floor, Burlington, MA 01803, USA.
- Koundinya, V. (2000). *A study on Annadata-Velugubata, a distance education programme in Chittoor district of Andhra Pradesh* (Master's Thesis). Acharya N G Ranga Agricultural University, Hyderabad, India.
- Koundinya, V., & Duttala, R. (2002). Impact of Annadata-velugubata, a distance education program on the knowledge gain in groundnut and mango cultural practices of the viewers in Chittoor district of Andhra Pradesh. *Journal of Research ANGRAU*, 30(2), 127-129.
- Koundinya, V., & Martin, R. (in press). Food safety inservice educational needs of agriculture teachers. *Journal of Agricultural Education*.
- Kwaw-Mensah, D. (2008). *Perceptions of agricultural extension educators regarding livestock waste management education in the North Central Region* (Doctoral Dissertation). Iowa State University, Ames.
- Laminack, J., Dainello, F., Degenhart, S. H., Vestal, T. A., & Wingenbach, G. (2008). Increasing positive perceptions of food irradiation: Appealing to one's affective domain. *Journal of Extension*, 46(4), Article number 4RIB3.
- Layfield, K. D., & Dobbins T. R. (2002). Inservice needs and perceived competencies of South Carolina agricultural educators. *Journal of Agricultural Education*. 43(4), 46-55.
- Layfield, K. D., Minor, V. C., & Waldvogel, J. A. (2001). Integrating science into agricultural education: A survey of South Carolina teachers' perceptions. 28th Annual National Agricultural Education Research Conference, December 12, 2001, 422-432.
- Lehtola, C. J. (2007). Developing and using table-top simulations as a teaching tool. *Journal of Extension*, 45(4), Article number 4TOT4.
- Lindner, J. R., Murphy, T. H., & Briers, G. H. (2001). Handling nonresponse in social science research. *Journal of Agricultural Education*, 42(4), 43-53.

- Long, H. B. (2004). "Understanding adult learners". In Galbraith, M. W (eds.), *Adult learning methods. A guide for effective instruction* (3rd Ed) (pp. 23-37). Krieger publishing company, Malabar, Florida. 32950.
- Madden, T. J., Ellen, P. S., & Ajzen, I. (1992). A comparison of the theory of planned behavior and the theory of reasoned action. *Personality and Social Psychology Bulletin*, 18(1), 3-9.
- Malmsheimer, R. W., & Germain, R. H. (2002). Needs assessment surveys: Do they predict attendance at continuing education workshops? *Journal of Extension*, 40(4). Article number 4FEA4.
- Marrotte, E. L. (2000). The evolution in using high tech teaching tools in outreach programs: From stone age to high tech. *Journal of Extension*, 38(5). Article number 5TOT2.
- Marsick, V. J. (2004). "Case study". Galbraith, M. W. (eds.), In *Adult learning methods. A guide for effective instruction* (3rd Ed) (pp. 383-404). Krieger publishing company, Malabar, Florida. 32950.
- Martin, R. A. (2009). *Presentation and sales strategies for agricultural audiences. A guide for planning & delivery of successful presentations that engage audiences*. Kendall Hunt Publishing Company, 4050 Westmark Drive, Dubuque, IA 52004-1840.
- Maund, B. (2003). *Perception*. McGill-Queen's University Press, Montreal & Kingston, Ithaca.
- McDowell, G. R. (2001). *Land grant universities and extension into the 21st century: Renegotiating or abandoning a social contract*. Iowa State University Press, 2121 South State Avenue, Ames, Iowa 50014.
- McDowell, G. (2004). Is Extension an idea whose time has come--and gone? *Journal of Extension*, 42(6), Article number 6COM1.
- Meer, R. R., & Misner, S. L. (2000). Food safety knowledge and behavior of expanded food and nutrition education program participants in Arizona. *Journal of Food Protection*, 63(12), 1725-1731.
- Merriam, S. B. (2001). Andragogy and self-directed learning: Pillars of adult learning theory. *New Directions for Adult and Continuing Education*, 89, 3-13.
- Miller, G., & Miller, W. W. (2009). Online graduate education needs of selected Iowa extension professionals. *Journal of Extension*, 47(3). Article number 3RIB7.
- Miller, L. E., & Smith, K. L. (1983). Handling nonresponse issues. *Journal of Extension*, September/October, 45-50.
- Morford, S., Kozak, R., Suvedi, M., & Innes, J. (2006). Factors affecting program evaluation behaviours of natural resource extension practitioners—Motivation and capacity building. *Journal of Extension*, 44(3), Article number 3FEA7.

- Motarjemi, Y., & Kaferstein, F. (1999). Food safety, hazard analysis and critical control point and the increase in foodborne diseases: a paradox? *Food Control*, *10*, 325-333.
- NCR-158 Committee on Adult Education in Agriculture (1990). *Empowering adults: A new agenda for agriculture. Focusing research in adult agricultural education*.
- National Integrated Food Safety Initiative (2010). *Food safety & biosecurity*. Retrieved from http://www.csrees.usda.gov/nea/food/in_focus/safety_if_national.html
- National Research Council (1988). *Understanding agriculture: New directions for education*. Washington DC.: National Academy Press.
- Newton, E. S. (1977). Andragogy: Understanding the adult as a learner. *Journal of Reading*, *20*(5), 361-363.
- Nordstrom, P. A., Wilson, L. L., Richards, M. J., Fivek, M. L., Ruffing, M. B., & Coe, B. L. (1999). Student attitudes toward animal-derived products and services and how they affect society and the environment. *Journal of Agricultural Education*, *40*(4), 10-19.
- Ota, C., DiCarlo, C. F., Burts, D. C., Laird, R., & Gioe, C. (2006). Training and the needs of adult learners. *Journal of Extension*, *44*(6), Article number 6TOT5.
- Otsuki, T., Wilson, J. S., & Sewadeh, M. (2001). Saving two in a billion: Quantifying the trade effect of European food safety standards on African exports. *Food Policy*, 495-514.
- Papalla, A. (1976). *Learner-centered language teaching: Methods and materials* [Abstract]. Newbury House Publishers, Inc., 68 Middle Road, Rowley, Massachusetts 01969.
- Parnes, R. B., Idell, W. C., Anastasia, K., Audrey, L., & Lichtenstein, A. H. (2003). Food irradiation: An overlooked opportunity for food safety and preservation [Abstract]. *Nutrition Today*, *38*(5), 174-185.
- Patil, S. R., Cates, S., & Morales, R. (2005). Consumer food safety knowledge, practices, and demographic differences: Findings from a meta-analysis. *Journal of Food Protection*, *68*(9), 1884-1894.
- Pennsylvania Impact (1999). *Building food safety into our food system*. College of Agricultural Sciences, Teaching, Research and Cooperative Extension Programs Work for Pennsylvania. U.Ed. AGR99-78 5M299PS23980. Retrieved August 3, 2010, from <http://paimpact.cas.psu.edu/pdf/agr9978.pdf>
- Place, N. T. (2007). *Principles of effective extension educational programs*. Document no. AEC 361, Department of Agricultural Education and Communication, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida.
- Polson, J. G. (1999). Using a videotape of a Master Farmer to teach others. *Journal of Extension*, *37*(2), Article number 2RIB1.

- Radhakrishna, R. B. (2001). Professional development needs of state extension specialists. *Journal of Extension*, 39(5), Article number 5RIB4.
- Radhakrishna, R., & Martin, M. (1999). Program evaluation and accountability training needs of extension agents. *Journal of Extension*, 37(3), Article number 3RIB1.
- Radhakrishna, R. B., & Thomson, S. (1996). Extension agents' use of information sources. *Journal of Extension*, 34(1), Article number 1RIB2.
- Reddy, A. A. (1993). *Extension Education* (5th ed). United States Library of Congress. Sree Lakshmi Press, Bapatla – 522 101, Guntur District, Andhra Pradesh, India.
- Reischmann, J. (2004). *Andragogy. History, meaning, context, function*. Retrieved from <http://www.andragogy.net>.
- Reisenberg, L. E., & Gor, C. O. (1989). Farmers' preferences for methods of receiving information on new or innovative farming practices. *Journal of Agricultural Education*. Fall, 7-13.
- Rennekamp, R. A., & Arnold, M. E. (2009). What progress, program evaluation? Reflections on a quarter-century of extension evaluation practice. *Journal of Extension*, 46(4), Article number 4RIB7.
- Rhode Island Food Safety Education, Cooperative Extension (2000). Food safety fact sheets glossary. Retrieved from <http://www.uri.edu/ce/ceec/food/factsheets/glossary.html>
- Roberts, K. R., Remig, V. M., Bryant, T. J., & Snyder, G. (2009). Older adults' technology preferences related to food safety education. *Journal of the American Dietetic Association*, 109(9), pg A64.
- Roberts, T. G., & Dyer, J. E. (2005). A summary of distance education in university agricultural education departments. *Journal of Agricultural Education*, 46(2), 70-82.
- Rodewald, A. D. (2001). Delivery systems--Is the "latest" technology the greatest? *Journal of Extension*, 39(4), Article number 4TOT2.
- Rogers, E. M. (1995). *Diffusion of innovations* (4th ed). The Free Press. A Division of Simon & Schuster Inc. 1230 Avenue of the Americas. New York, NY – 10020.
- Rollins, T. J., & Scholl, J. F. (1992). Learning styles of 4-H members. *Journal of Extension*, 30(1), Article number 1RIB1.
- Roseman, M. G., & Hayek, K. (2005). Determining the success of food safety education to elderly participating in congregate and home-delivered meal programs. *Journal of the American Dietetic Association*, 105(8), pg 13.
- Sanborn, D. (2007). *Foodborne disease*. Retrieved July 15, 2010, from <http://www.outpostmagazine.com/2007/10/13/foodborne-disease/>

- Schuh, J. H. (1996). "Why students affairs needs a comprehensive approach to assessment". In Michael L Upcroft & John H Schuch (eds.). *Assessment in student affairs: A guide for practitioners*. (pp.3-31). Jossey-Boss Inc., Publishers, 350 Sansome street, San Fransisco, California 94104.
- Schunk, D. H. (2008). *Learning theories. An educational perspective* (5th ed.). Pearson Education, Inc., Upper Saddle River, New Jersey 07458.
- Schwarz, M. H., & Gibson, J. (2010). A needs assessment of aquaculture extension agents, specialists, and program administrators in extension programming. *Journal of Extension*, 48(2), Article number 2FEA6.
- Seevers, B. S., & Foster, B. B. (2004). A profile of female county agricultural agents in today's CES. *Journal of Extension*, 42(6), Article number 6FEA3.
- Seevers, B., & Foster, B. B. (2003). Women in agricultural and extension education: A minority report. *NACTA Journal*, Mar 2003, 32-37.
- Seevers, B., Graham, D., Gamon, J., & Conklin, N. (1997). *Education through Cooperative Extension*. Delmar Publishers, 3 Columbia Circle, Box 15015, Albany, New York, 12212-5015.
- Selby, K. A., Peters, J. L., Sammons, D. J., Branson, F. F., & Balschweid, M. A. (2005). Preparing extension educators for a global community. *Journal of Extension*, 43(4). Article number. 4RIB1.
- Shanley, E. L., Thompson, C. A., Dziura-Duke, C., & Rodriguez, N. (2009). Innovative food safety education for low literacy food service employees using traditional versus distance learning methods. *Journal of the American Dietetic Association*, 109(9), pg A63.
- Shanteau, J. (1992). Competence in experts: The role of task characteristics. *Organizational Behavior and Human Decision Processes*, 53(2), 252-266.
- Shinn, Y. (1997). *Teaching strategies, their use and effectiveness as perceived by teachers of agriculture: A national study* (Doctoral Dissertation). Iowa State University, Ames.
- Singleton, J., & Hillers, V. V. (2006). The extension programme and food safety education in the USA. *British Food Journal*, 108(9), 771-774. doi: 10.1108/00070700610688395
- Small, R. M., Waterbury, J. A., & Mark, D. R. (2008). Livestock insurance web site: A learning tool for producers, insurance agents, and educators. *Journal of Extension*, 46(3), Article number 3TOT4.
- Smith, S., & Davis, D. (2008). The use of radio broadcast, internet, and podcasting in a family life education program, 46(2), Article number 2IAW1.
- Smith, M. F., & Lincoln, Y. S. (1984). Another kind of evaluation. *Journal of Extension*, 22(6), Article number 6FEA1.

- Steimle, B. M. & Duncan, S. F. (2004). Formative evaluation of a family life education web site, *Family Relations*, 53(4), 367-376.
- Stone, B., & Coppernoll, S. (2004). You, extension and success: A competency-based professional development system. *Journal of Extension*, 42(2). Article number 2IAW1.
- Sudman, S. (1976). *Applied sampling*. Academic Press, INC. 111 Fifth Avenue, New York, New York 10003.
- Sustainable Agriculture Research and Education (2008). *How to apply for SARE grants*. NCR-SARE Home. Website: <http://sare.org/ncrsare/apply.htm>
- Taylor, M. C., & Curtis, P. A. (1999). Development and design of a “Gateway” to food safety information on the internet for extension educators. *Journal of Extension*, 37(2), Article number 2FEA5.
- Ten Eyck, T. A., & Deseran, F. A. (2001). In the words of experts: the interpretive process of the food irradiation debate. *International Journal of Food Science and Technology*, 36, 821-831.
- Thomson, J. S., Abel, J. L., & Maretzki, A. N. (2001). Edible Connections: A model to facilitate citizen dialogue and build community collaboration. *Journal of Extension*, 39(2), Article number 2FEA5.
- Toro, E. M., & Place, N. T. (2004). *Perceptions of livestock extension education delivery among dairy producers in the north coast of Honduras*. Proceedings of the 20th Association of International Agricultural and Extension Education conference, Dublin, Ireland, 450-461.
- Trepka, M. J. (2008). Interactive multimedia can be used effectively in food safety education. *Journal of the American Dietetic Association*, 108(6), pg 985.
- United States Department of Veteran Affairs (2008). Methodological challenge. Using qualitative research methods. Retrieved from http://www.colmr.research.va.gov/mgmt_research_in_va/methodology/qualitative_research.cfm#2
- Universal Teacher Publications (2009). *Organizational behavior – concepts and applications*. Retrieved July 27, 2010, from <http://www.universalteacherpublications.com/mba/ebooks/ob/index.htm>
- University of Idaho (2006). *Research methods. How psychologists conduct research*. Retrieved from <http://www.class.uidaho.edu/psyc101/ResearchMethods6.pdf>
- Van Den Ban, A. W. & Hawkins, H. S. (1996). *Agricultural Extension* (2nd ed). Blackwell Science Ltd. Onsey Mead, Oxford OX2 0EL.

- Walczyk, J. J. & Ramsey, L. L. (2003). Use of learner-centered instruction in college of science and mathematics classroom. *Journal of Research In Science Teaching*. 40(6), 566-584.
- Wardlaw, M. K. (1999). Empowering consumers: Hamburger safety. *Journal of Extension*, 37(3), Article number 3IAW5.
- Warner, P. D., Christensen, J. A., Dillman, D. A., & Salant, P. (1996). Public perception of extension. *Journal of Extension*, 34(4), Article number 4FEA1.
- Webster, J., Rogers, D. L., & Mariger, S. C. (2001). Utah extension educators' perceived satisfaction with and needs for agricultural health and safety information. *Journal of Extension*, 39(2), Article number 2RIB3.
- West, B. C. (2007). Conducting program evaluations using the internet. *Journal of Extension*, 45(5), Article number 1TOT3.
- White, B. A., & Bridwell, C. (2004). "Distance learning techniques". In Galbraith, M. W (eds.), *Adult learning methods. A guide for effective instruction* (3rd Ed) (pp. 273-288). Krieger publishing company, Malabar, Florida. 32950.
- White, B. A & Brockett, R. G. (1987). Putting philosophy into practice. *Journal of Extension*. Vol 25, 11-14.
- Wilcock, A., Pun, M., Khanona, J., & Aung, M. (2004). Consumer attitudes, knowledge and behaviour: a review of food safety issues. *Trends in Food Science & Technology*, 15, 56-66. doi: 10.1016/j.tifs.2003.08.004
- Wipon, A., Rodolfo Jr, M. N., & Nichols, J. P. (2003). The promise of food irradiation: Will consumers accept it? *Choices, The magazine of food, farm and resource issues*, 3rd quarter, 31-34.
- Witte, J. E., & Witte, M. M. (2004). "Interactive television". In Galbraith, M. W. (eds.), *Adult learning methods. A guide for effective instruction* (3rd Ed) (pp. 253-271). Krieger publishing company, Malabar, Florida. 32950.
- World Health Organization (2007). *Food safety and foodborne illnesses*. WHO Media centre. Retrieved from <http://www.who.int/mediacentre/factsheets/fs237/en/>
- World Health Organization (1999). *Food safety. An essential public health issue for the new millennium*. Food Safety Programme, Department of Protection of the Human Environment, Cluster of Sustainable Development and Healthy Environments, World Health Organization, Geneva. WHO/SDE/PHE/FOS/99.4
- Xie, K., & Gu, M. (2007). Advancing Cooperative Extension with podcast technology, *Journal of Extension*, 45(5), Article number 5TOT2.
- Yin, R. K. (2003). *Case study research. Design and methods* (3rd ed). Applied Social Research Methods. Vol 5.

Zinn, L. M. (2004). "Identifying your philosophical orientation". In Galbraith, M. W. (eds.), *Adult learning methods* (pp. 39-78). Krieger Publishing Company, Malabar, Florida.