

2012

Assessment of native languages for food safety training programs for meat industry employees

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Assessment of native languages for food safety training programs
for meat industry employees

by

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

DOCTOR OF PHILOSOPHY

Major: Meat Science

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Ames, Iowa

2012

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DEDICATION

I dedicate this work to all my students, who throughout the years have taught me much more than I have taught them. I hope that I have mentored and advised in a manner which not only conveyed information that will make them successful professionals, but that I have taught them about the importance of good citizenship, the significance of good parenting, and that leading Godly lives and serving others is the ultimate reward in this life.

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CHAPTER 1. GENERAL INTRODUCTION

A safe food supply is a luxury that many take for granted each day. In the United States most consumers do not give a thought to the origin of their food, how it was manufactured, packaged, stored, shipped, and placed on shelves waiting to be purchased. It is only important to them that at any time a specific product is needed, it can be purchased. Busy lifestyles place particular emphasis upon convenience, and many meat and food companies keep their research and development staffs busy developing new, improved, or more nutritious foods to meet the requests of their customers. Therefore, the level of competition between companies that produce meat, poultry, and food products never subsides, as each one is vying for the consumer dollar. And in stressful economic times, the availability of safe, nutritious and wholesome food is even more important as families strive to ensure that each dollar spent for food is a dollar wisely spent.

“Food safety involves everybody in the food chain,” (Johanns, 2011). The production of safe food involves all those that are part of its production, just as Johanns has stated. As once governor, and now senator from the state of Nebraska, Johanns is very knowledgeable about the importance of our nation’s food supply (Johanns, 2011). Nebraska is well known as a state heavily involved in livestock and grain production, and is a home to the meatpacking industry. The growth of this industry in Nebraska (and other states like it) soon diminished the group of available laborers, so workers from outside the state were brought in to work in the plants. These employees were most often immigrants coming from any number of countries, all new to the United States (US) – as well as the cultures and traditions found in their new homes. They came to the US in search of jobs, many of which required little or no skills – and their capability to write and speak English was not heavily considered at the time of hiring. However, by establishing homes in these communities, their lack of communication skills caused a change in the social and economic structure of those communities.

These non-English speaking individuals came to places like Nebraska to find work – and many of them in an industry that ultimately serves millions of individuals across the US, and outside the borders of our country. The beef, pork, and poultry industries in the United States have significant impact upon the US economy. Therefore, the nation’s livestock producers place their livelihoods in the hands of the managers and employees in these plants – trusting them to handle the carcasses in a manner that will produce safe products for consumers. Fortunately for consumers and producers alike, the United States Department of Agriculture established the Food Safety and Inspection Service which regulates the manufacturing of such products to insure that safe foods are produced. However, the lack of communication skills of the non-English speaking laborers may complicate their ability to understand those regulations.

Recognizing the importance of food safety, many companies have developed safe food handling programs designed to teach basic safe food handling skills. Cook, chill, clean, and separate are the basic principles taught in many of these programs. Upon learning these basics, educational

programs delve further into safe food production practices that include topics such as Good Manufacturing Practices, Hazard Analysis Critical Control Point Programs, and Sanitation Standard Operating Procedures. However, in many cases these programs are taught in the English language to English - speaking audiences. What about those employees with limited or no English communication skills? Do they understand what is being taught? How do we know they indeed understand this material? The uncertain answers to these questions have caused concern among companies whose labor pool is full of immigrant laborers. The bottom line for these companies is to make money with the least amount of costs, and there is little room for error in the manufacturing process. Such errors could result in recalls of their product, and recalls can cost companies their existence in the industry due to irreparable damage to their company and the loss of trust by the consumer.

Therefore, the first objective of this study was to evaluate a food safety program taught in English to English-speaking individuals who were potential employees of a poultry processing facility. Pre- and post-training assessments were administered, and it was hypothesized that significant improvement would be realized when comparing the two sets of scores. Because this plant also hired non-English speaking persons, the second objective of this study was to teach the same program in Spanish to Spanish-speaking individuals and measure their ability to learn the material via comparison of pre- and post-training assessments. It was expected that because the material was being taught in the individuals' native language that significant improvement would be realized, proving that this material could also be learned by this population. The third objective of this study was to compare the levels of improvement of the English speaking and the non-English speaking groups. Because each group was taught the same material in their native languages, it was hypothesized that they would each reach a similar level of knowledge gained throughout the training program.

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Dissertation Organization

This dissertation is organized into four chapters. The first chapter is a general discussion concerning the importance of a safe food supply to the US economy and that safe food handling programs must be taught so that all employees can learn the material. The second chapter is a literature review that provides information pertinent to this study. The third chapter is a paper titled "Assessment of Native Languages for Food Safety Training Programs for Meat Industry Employees." Chapter 4 provides a general summarization of this study.

CHAPTER 2. LITERATURE REVIEW

2.1 History of Immigrant Employment in United States' Meat, Poultry, and Food Industries

"History is a guide to navigation in perilous times.

History is who we are and why we are the way we are." David C. McCullough, Author

In 1906 journalist Upton Sinclair published *The Jungle* (1906), a fictional story about the meatpacking industry near the Chicago Union Stockyards in Chicago, Illinois. This 475-acre stockyard was the shipping point for thousands upon thousands head of cattle, sheep, and swine primarily from the Midwest and destined to fulfill the nation's meat demands. Seventy thousand head of hogs filled over 2,000 pens at any time waiting for harvest. At one time 190,000 head of hogs were harvested in one 24-hour period, setting a record for one day's harvest (Pacyga, 2003). By 1900 this facility produced 82 percent of all meat consumed in the United States (US) (Bodinet, retrieved December 23, 2011). Henry Ford, founder of the Ford Motor Company, developed manufacturing systems for the automotive industry after visiting the Chicago meatpacking plants (Ford, 1922).

"I aimed at the public's heart, and by accident I hit it in the stomach" was Sinclair's famous quote. His motive for penning *The Jungle* was to bring public attention to the poor labor conditions for a diverse group of immigrant employees in the packing plants, many who could not speak or understand the English language. The US was known as the land of opportunity, and these immigrants were more than willing to perform dangerous and dirty jobs in order to provide (for what they were told were) brighter futures for their families. Initially, immigrants came from Germany and Ireland to work in the plants. Soon industry growth and the need for workers found families from across Europe, African countries, and Mexico relocating to Chicago to seek out employment (Entwistle, 2008).

Friedman (2007) studied immigration to the US and cited research (Daniels, 2002; Pozzetta, 1995) showing that particularly after the 1860's, employment opportunities brought large numbers of immigrants to the US. In 1908, immigration rates were nearly 70 percent from the Balkans, 63 percent from Greece, 58 percent from Italy, 34 percent for the Austro-Hungarians, 22 percent from Germany, and 12 percent for the British (Gould, 1980). Interestingly, there was also return migration by many of these workers back to their homelands. Even in times of peak immigration to the US, there were substantial numbers of people who were returning to their home countries. Many individuals did not come to the US with intentions of establishing permanent homes. Many perceived the US as a place to earn enough money so that they could return and purchase land or establish businesses – opportunities not available to them without first going away to accumulate funding. Italian immigrants serve as examples of these types of situations. They used the US as a site of labor immigration and found work as stonemasons working on bridges and tunnels for the nation's transportation infrastructure, as well as the construction of Panama's Suez Canal. Once they had earned the funds they needed to successfully engage in land acquisitions and new businesses in Italy, they took their

wages back home with them (Audenino, 1991). Wyman (1993) found that many other Europeans who were unhappy in the US returned to their homelands. Like the Italians, others returned as soon as they had earned enough money to pursue their goals upon their return home. Those who stayed in the US typically duplicated communities and cultures of which they were already accustomed instead of assimilating to American customs and the English language (Tilly, 1976).

A tumultuous time in the Chicago Union Stockyards occurred in the 1920's with the formation of union labor organizations and subsequent demands by stockyard and meatpacking industry employees. Following World War I, Europeans were restricted from migrating to the US, thus causing the meatpacking industry to become desperate for laborers. Up until that time, immigration numbers had been on the rise. There were no legal restrictions for entry into the US before 1882, although there was concern raised by the Know-Nothing political party in the 1850's. The Know-Nothing Party (also known as the American Party) was a US political party established in the 1840's and acquired their name because when party members were questioned about their beliefs concerning immigration and nationalism they replied that they "knew nothing". The members of this party were anti-immigrant and anti-Roman Catholic and they felt that the increasing numbers of German immigrants in the Midwest and Irish immigrants in the East were threatening the economic and political successes of the Protestants in the US. This party focused upon three specific items: excluding persons born in countries other than the US from voting or holding public offices, immigration restrictions, and requiring individuals from other countries to establish residencies in the US for 21 years. This party reached a pinnacle in 1855, and then fell apart by 1856 due to membership divisions concerning the legalities of slavery (Britannica Online Encyclopedia, accessed December 23, 2011).

In 1882 the Chinese Exclusion Act prohibited Chinese immigrants from entering the US. This act was the first time that the federal government prohibited an ethnic working group from entering the US. This law also placed new requirements upon those Chinese individuals who were already in the US by requiring them to obtain certifications in order to re-enter the US should they leave for any reason. This act was extended in 1892 and re-named the Geary Act. The Geary Act was made permanent in 1902 and forced each Chinese US resident to register and obtain a residence certificate. By the 1920's the anti-Chinese tension began to subside and the 1943 US congress began enacting new legislation by repealing the Geary Act and replacing it with regulations allowing 105 Chinese per year to enter the US and allowing Chinese individuals born in China to acquire naturalization (US National Archives & Records Administration, assessed December 23, 2011).

Japanese immigration was reduced in 1907 through a mutual agreement between Japan and the US. That was the same year that the Immigration Commission was established with the goal of investigating immigration. In 1917, Senator William Dillingham led the charge claiming that immigrants from the Europe did not conform to their new homes in the US easily, and they were responsible for economic problems – thus the Literacy Test became law. This same law also denied

entry to Asian immigrants from any country. In spite of the Literacy Test, immigration from Europe resumed to previous levels after World War I. It was at this time that Senator Dillingham made another effort to limit the number of immigrants entering the US. This began in 1921 with the Quota Act and then in 1924 with the National Origins Act. The 1921 law kept the numbers of immigrants entering the US at a level proportional to a particular country's population already in the US; the 1924 Act directed immigrants to obtain visas from an American consulate before immigrating (Cohn, 2010). Therefore African Americans, Mexicans, and women were hired to fill positions in meatpacking plants. The Mexicans hired were characterized as primarily single men who had been in the US less than five years. They had previously worked as laborers in the railroad industry or as migrant workers in the agricultural industry. Plant owners considered Mexican men to be cheap laborers who were willing to work at some of the most undesirable jobs in the industry. Many of them came to Chicago from meatpacking plants in Kansas City, Missouri and Omaha, Nebraska. By the mid-1920's, three percent of the employees at the Swift and Armour meatpacking plants, as well as three percent of the employees at the Wilson meatpacking plant, were Mexican (Halpern, 1997).

The 1929 Depression in the US was a particularly difficult time for the meatpacking industry. There were so many people desperate for work that the managers used these predicaments as leverage to retaliate against those laborers who either participated in strikes or were involved in organizing such events (Halpern, 1992). More Mexicans became laborers in these plants in the 1930's (Horowitz, 1997). The decades that followed witnessed increasing dissention between packinghouse owners and managers and the laborers whose jobs were to increase plant production at minimum costs. Workers continued to unite and present their concerns to the owners and managers. Throughout the years a number of unions were developed, and then merged in order to strengthen their voices in concern for the welfare of the worker. In early 1965, *Newsweek Magazine* (1965) quoted Andy Anderson, co-founder of the Iowa Beef Packers (IBP), as saying, "We've tried to take the skill out of every step. We wanted to be able to take boys right off the farm and we've done it." By eliminating the need for employees with specific skills to work on the lines, lower wages could be paid to employees, thus saving the plants money while still meeting production demands.

In the 1970's, the meatpacking industry was forced to improve the efficiencies of operating plants and changing methods of operation in order to increase profits. This meant moving the industry away from the traditional metropolitan areas to rural areas where the livestock were being produced. The recruitment of local men and women to work in the new plants also subdued the influence of unions bargaining for higher wages and improved working conditions. However, that source of local laborers was quickly drained. Therefore, recruitment efforts included hiring a workforce unfamiliar with the rural areas where new plants were being built (Warren, 2000). The 1970's saw changes in the industry similar to the early 1900's. Researchers concluded that workers could be characterized as unskilled migrant laborers that could move from job to job and have little involvement with organized

labor. These attributes fit the economic model that the owners were establishing in the meatpacking industry (Fink, 2003; Olsson, 2002; Hackenberg, Griffith, Stull, and Gouveia, 1993; Griffith, 1990; Bonacich, 1972).

The 1980's saw ConAgra of Monfort, Colorado; Excel (owned by Cargill); and IBP initiate major business overhauls due to increased competition from other protein sources (i.e., pork and poultry), as well as the lack of modern facilities. Consequently, these three big packers gained control of over 70 percent of all beef harvested in the US. The following attributes helped them increase their profits: operating plants near livestock production areas; transitioning to automated systems; implementing more efficient uses of animal by-products; and eliminating the employees' union contracts. Consumer demand for new and convenient meat products changed manufacturing systems used to prepare and package these items. Assembly line systems were developed to fabricate the fresh and processed meat, increasing the need for unskilled laborers. Recruiters continued to focus upon immigrant laborers to meet the needs of the plants (Kandel and Parrado, 2005).

Haverluk and Trautman (2008) credited the 1985 strike at the Hormel meatpacking plant in Austin, Minnesota for initiating a major transition to immigrant labor in pork, poultry and turkey processing plants. Laborers from Mexico, as well as the Central American countries of El Salvador and Guatemala, were hired (Gouveia and Juska, 2002). Desperate for work, African-Americans and women had been traditionally employed to work in the poultry industry because they would accept lower wages; therefore they were used to break existing labor unions in the plants. In 2001, *The New York Times* (2001) reported that of the total numbers of employees in poultry plants, 50 percent were Hispanic; of those Hispanic employees, 25 percent were illegal immigrants.

The meatpacking industry has high turnover rates that vary from 40 to 100 percent per year (Hedges and Hawkins, 1996; Kandel and Parrado, 2005). Many laborers begin looking for new higher-paying jobs immediately upon moving to the US, and many do not work for more than six months in the industry before leaving for other jobs. Subsequently, this improves the bottom line for the meatpacking plants because these laborers do not stay employed by the companies long enough to take advantage of health care benefits and hourly wage increases (Stull, Broadway, and Griffith, 1995). In May 2008, it was reported that meatpacking plant employees, regardless of ethnicity, earned an hourly wage of \$11.16 (annual wage of \$23,220). Iowa topped the list as the state with the highest concentration of employees working in the industry with an average hourly mean wage of \$11.96 (calculated to an annual wage of \$24,880). In comparison, Massachusetts paid the highest hourly wage of \$16.22 an hour (\$33,730 annual mean wage) (United States Department of Labor, 2008).

2.2 Overview and Trends of Immigrants Employed in the United States

From 1850 to 1990, the Hispanic population in the US grew from 100,000 people to nearly 22,000,000 people (Haverluk & Trautman, 2008). From 1990 to 2000 in the US, the numbers grew by 57.9 percent to 36,000,000 people, comprising 12.5 percent of the population. The Center for Immigration Studies reported that since the year 2000, 23.7 percent of all immigrants coming into the US have originated from the Caribbean, Central America, and South America. Immigrants from Asia have numbered 23.5 percent, and 6.3 percent have come from Africa or the Middle East (Gabbett, 2009). Between 1990 and 2000, almost nine percent of the total US Hispanic population lived in the Midwest. Hispanic immigrants were already working in the meatpacking industry, thus shifting the Hispanic population to those rural Midwestern states where this industry was established (Gouveia and Stull, 1997). The 2001 US Census Bureau reported that although Hispanic populations traditionally settled in the Southwest, increases in the Hispanic population from previous census reports had occurred in the Midwest (81 percent), the South (71.2 percent), the West (51.8 percent), and the Northeast (39.9 percent). In Minnesota and Nebraska, the Hispanic population had tripled, and in Iowa and Kansas the population had more than doubled. Beardstown, Illinois; Frankton, Indiana; Storm Lake and Denison, Iowa; Garden City and Dodge City, Kansas; McDonald and Sullivan Counties in Missouri; and Grand Island, Nebraska were all affected by immigration.

The 2006 US Census Bureau reported that the numbers of Hispanics in the US had increased to 44.3 million Hispanics (14.8 percent of the US population) due to immigration or the births of Hispanic children in the US. In addition, 52 percent of Hispanics claim Mexican heritage, 24.9 percent claim Puerto Rican ancestry, and 18.9 percent have indicated that Cuba is their homeland. In 2008, the census reported that there were 281.4 million people in the US and Hispanics comprised the largest minority. In 2012, Hispanics are expected to number 35 million with Hispanic males comprising the largest number of all minorities, followed by Asians, white non-Hispanics, and blacks; among females black females will number first, followed by Asians, white non-Hispanics, and Hispanics (US Census Bureau Population Division, 2010). Estimates suggest that by 2030 there will be 8,000,000 Hispanics in the Midwestern states, and Hispanic populations will comprise 50 percent of Kansas and Nebraska's total populations.

Hispanic population growth in the US can be partially attributed to the beef and pork meatpacking industry. In the 1990's, 329 Hispanics were reported to be living in Lexington, Nebraska. Lexington was selected as the site for a new IBP facility so as to be near a source of finished cattle for harvest from the feedlots located in that region. The need for more laborers in the plant exceeded the supply of workers available in that location. Therefore, the Immigration and Naturalization Service (INS) opened offices in the southwestern US and sent laborers from west-central Mexico and those living along the US-Mexico border to Lexington to fill that need. The 2000

US census reported 5,121 Hispanics living in Lexington, comprising 51 percent of the city's total population.

In the 1970's, pork production experienced dramatic changes with operations becoming vertically integrated. A large sector of the nation's pork production moved to North Carolina where the environment was more favorable, making cost of production more economical. Immigrants were brought from Latin America and the southwestern US in the 1990's to meet the labor demands. Subsequently, the Hispanic population in North Carolina grew by 300 percent. However, pork production became more concentrated and caused water pollution, odor problems, and decreased housing values. The industry's growth in North Carolina has been impacted by heightened state regulations and production has since spread to Colorado, Missouri, Oklahoma, and Utah.

Liaw and Frey (2007) studied the educations of whites, blacks, Asians, and Hispanics. Studies showed that lower educational levels of Hispanics and blacks correlated to them moving more frequently when compared to whites and Asians. Hispanics with the lowest levels of education had the highest rate of movement among all groups studied. Co-ethnic communities continued to draw immigrants, although this trend declined in the late 1990's, especially for Hispanics and blacks. Regardless of ethnic group, immigrants were attracted to regions where there were possibilities for increased incomes, particularly jobs in service areas. Men born outside the US were more likely to be employed in construction, maintenance and natural resources, whereas women born outside the US were more likely to be employed in jobs requiring manual labor, production and transportation (United States Department of Labor, 2008). Because the workforce in the US is getting older, new employees will be needed in order to maintain production levels. By 2012, the nation's employees between 25 and 54 years old will comprise 66 percent of all employees; and the percentage of persons at least 55 years old will increase from 14.3 to 19.1 percent. Hispanics are expected to comprise 23.8 million of the nation's employees in 2012 and they will continue to become integral members of the US labor force due to the age of current employees and the increase in the number of retirees. Based upon trends, the white non-Hispanic population will grow at a slower rate and is expected to comprise 66 percent of the nation's workforce (Toossi, 2004).

2.3 Community Changes Due to Immigrant Populations

Concern has been raised about the US economy due to an increased immigrant population and the question has been raised as to whether or not any benefits are derived from this influx of immigrants. The economic growth of communities may be realized as businesses cater to these people as new consumers. This increase in business strengthens the tax basis' for communities. However, these communities are not immune to major economic and social changes due to the new faces of the population. New Hispanic residents in small, rural towns initiate change by creating needs for bilingual education, health care, low income housing, and social services - therefore raising

taxes for all residents. Immigration opponents allege that border patrols, drug enforcement agencies, education, fire and police departments, health care, naturalization service, prisons, and the welfare system are all potentially hindered by the arrival of immigrant labor. Georgia is home to the second largest Hispanic population in the US and in 2006 passed legislation restricting social services due to the increase in costs. The influx of Hispanic populations also generates conversations concerning their assimilation into larger communities. Established residents claim that Hispanic populations should strive to conform to long-standing community traditions when creating homes in Anglo-Saxon communities. Historically, by the third generation Hispanics begin to assimilate to their new surroundings. Cantu (1995) suggested that economic or social problems could be diminished by disallowing the development of smaller immigrant community groups that would eventually develop into immigrant communities.

Artz, Orazem, and Otto (2007) studied the Bureau of Labor Statistics' Longitudinal Database that tracked economic and social changes from 1990 to 2000 in communities with and without meatpacking and processing facilities. Communities were compared based upon county employment, crime rates, wages and income, and local government expenditures for education, health and police protection. They found that as meatpacking plants employed more workers and the wages increased, the overall employment levels also increased but the wages increased at slower rates (when compared to counties with no meatpacking or processing industries). The overall growth in income was not affected because of the negative wage effect found in the meatpacking industry which annulled any increase in employment opportunities. This slow growth in employment occurred at the expense of employment growth in other areas. These researchers found no differences in the occurrence of property or violent crimes, increased expenditures for local government, or that education, health services, or police protection suffered.

Rural communities must address issues when native populations leave communities because of increases in the numbers of immigrants (Stanley, 1992). Wahl, Breckenridge, and Gunkel (2006) discussed the development of "white flight". "White flight" occurs when the white population moves away from traditionally white residential areas in a city, town, or community because of an increasing population of Hispanics or other ethnic groups. Emporia, Kansas and Lexington, Nebraska are examples of communities where this has occurred. The "white flight" phenomena was tracked for ten years, and in that time span the non-Hispanic population reportedly declined by 10 percent in Emporia and six percent in Lexington. These changes were attributed to the growth of the meatpacking industries in these communities, as well as increased employment opportunities in service sectors. Brooks, Alberta, Canada and Garden City, Kansas were compared because both cities have meatpacking plants (Broadway, 2007). Although the type of work remained the same, differences were noted between the two cities. Canada enforced stricter immigration policies that emphasized recruitment of highly skilled laborers, so they relied on Asian and Sub-Saharan refugees

to fill the needed pool of workers. In the US, workers were recruited from a poorer neighbor (Mexico, etc.), so the work force was comprised mainly of Hispanic laborers with fewer skills. In addition, Hispanic families are closely knit units, and so US recruiters often focused upon keeping these families together, thus the number of Hispanic immigrants may increase accordingly.

In the US, intense discussions have been initiated concerning English language requirements for immigrants to the US. Conversations have centered upon the abilities of the adults to communicate in English, thus making it easier for them to find and maintain jobs. In addition, by mastering the English language these adults influence youth in their homes and communities to also learn the English language. Batalova and McHugh (2010) found that the top ten languages spoken in English Language Learners' (ELLs') homes were: Spanish (73.1 percent); Chinese (3.8 percent); Vietnamese (2.7 percent); French/Haitian Creole (2.1 percent); Hindi and related (1.8 percent); Korean (1.5 percent); German (1.5 percent); Arabic (1.2 percent); Russian (1.1 percent); and Miao/Hmong (1.1 percent). These languages were identified based upon an analysis of the Census Bureau's 2009 American Community Survey performed by the Migration Policy Institute. This particular survey asked individuals to identify the language spoken in their homes. ELLs were described as those students aged 5 – 18 years of age who stated on their surveys that they spoke English "less than very well". In the state of Iowa from 1990 to 2000, the numbers of students that could not communicate in English increased from 9,059 students to 20,744 students. In that same decade the percentage of Hispanic students enrolled in Iowa's public schools increased 162 percent (Iowa.gov, assessed December 23, 2010). In a family with young persons considered ELLs, the parent is half as likely to have earned a two- or four-year degree and the family is more likely to be considered a low-income household. Sixty-six percent of ELLs have a parent with steady employment, but that parent typically earns much less than an individual who is fluent in the English language. ELLs who are old enough to be enrolled in schools are younger than children from English-speaking families who are not yet enrolled and this may be due to the high birth rates commonly found with immigrant families, increased immigration rates, and trends for immigrants to take more time to learn the English language (Editorial Projects in Education Research Center, 2009).

2.4 Food Safety Regulations Impact Food Safety Education Programs

The Jungle was a story of immigrant labor in meatpacking plants. President Theodore Roosevelt and the public became appalled when the unsanitary practices used to process and package meat products for consumption were disclosed. Roosevelt demanded the United States Department of Agriculture (USDA) to investigate the Chicago stockyards and the meatpacking plants (Spiegel, 2003). These investigations resulted in the passage of the 1906 Meat Inspection Act which established the ante mortem inspection of live cattle, goats, sheep, and swine, as well as the postmortem inspection of their carcasses. This act also required the USDA inspection of slaughter

and processing facilities. In 1957, the comparable Poultry Products Inspection Act was made into law (Aberle, Forrest, Gerrard, and Mills, 2001).

More than a century has passed since this landmark legislation and researchers have continued to develop preservation technologies to further enhance the safety of the US food supply. Drying, irradiation, thermal processing, and the use of non-meat ingredients to reduce and/or eliminate microbial contamination have all been scrutinized (Aberle, Forrest, Gerrard, and Mills, 2001). In 1996 the Food Safety and Inspection Service, United States Department of Agriculture (FSIS-USDA) implemented the Hazard Analysis Critical Control Point (HACCP) system for meat and poultry products (Corlett, 1998). The Pillsbury Company developed this system in 1959 to ensure that foods consumed during National Aeronautics and Space Administration (NASA) space flights were free from microbial contamination, which could become perilous for astronauts during missions (Stevenson and Bernard, 1995). HACCP is science-based and envelops all phases of meat, poultry, and food production from point of origin through distribution in order to prevent, reduce, or eliminate biological, chemical, or microbiological hazards. Manufacturing steps are identified where such hazards could occur and hurdle systems are included in the manufacturing process to help eliminate situations where product contamination could occur. This system is designed to regulate and subsequently document production of safe meat, poultry, and food products (Stevenson and Bernard, 1995).

Paralleling advancements in the research and technology of safe food production, effective food safety education programs are continually being developed to teach an increasingly diverse population. The 1862 Morrill Act directed land grant universities to educate US citizens in the areas of agriculture, home economics, mechanics, and other practical professions. The Smith-Lever Act in 1914 initiated the partnership between land grant universities and the USDA. Its purpose is to educate and demonstrate updated methods applicable to homemaking, on farms and ranches, and for persons working in agriculture and related fields. During World War I, consumers were taught about improved farm production, marketing, and maintaining the qualities of perishable meats, poultry, and foods via canning, drying, and preserving. The value of the Extension Service was heightened during the Great Depression as homemakers learned to become more proficient in food preparation and preservation, good nutrition, livestock production, and other skills required to maintain healthy households (United States Department of Agriculture, 2009).

Today, family and consumer science extension programs continue to educate the public by teaching about food safety and nutrition, child care, communication, economics, and health care, (United States Department of Agriculture, 2009). Effective safe food handling practices for home and industry must be taught, especially due to the numbers of immigrants employed in the food and meat industries. A variety of industries are transforming their companies from places where employees perform tasks to places where employees learn to perform their tasks more effectively, by using cross

training systems and just-in-time training systems. Studies performed by Knowledge Assessment Management have found that as companies invest in employee training programs, they earn higher returns in the stock market and may be found among the top 20 percent of all companies in earnings. Current estimates suggest that over forty million Americans cannot read effectively, and many of these persons are immigrants who are employed in the US workforce. Companies have started to implement programs that teach reading, writing, and basic math in their workers' native languages (Dutkowsky, 2011).

Taylor (2003) found that the commitment made toward employee education so as to improve effectiveness and productivity results in those employees becoming stakeholders and working to help the companies survive during tough economic times. The implications of unsafe food handling practices and the transmission of foodborne illnesses were studied by Mitchell, Fraser, and Beardon (2007). Company culture and organization were identified as two areas affecting food safety behavior, therefore, proper food safety behavior must be taught to the workers, and the workers must adopt those behaviors and put them into practice. Teaching employees about individual and environmental influences when handling food is extremely important so that employees can recognize and confront barriers that inhibit or prevent proper food safety behavior. Obviously, proper safe food handling behavior is of the utmost importance because the products that are manufactured impact thousands of people, many of whom are particularly susceptible to foodborne illnesses.

Not all food safety education programs involve employees in meatpacking and food manufacturing systems. Effective programming must also be developed and targeted towards the particularly vulnerable groups of infants, pregnant women, immuno-compromised persons, and the elderly. Older adults are one of the most susceptible populations to foodborne bacterias and many of them have questionable food handling practices. It may be easy to forget to teach them about food safety as it may be presumed that they already know how to handle food properly due to their ages.

Cates, et al. (2009) surveyed 1,140 adults at least 60 years in age about their attitudes concerning food safety, their knowledge about specific foodborne pathogens, their self-reported knowledge and use of proper safe food handling and consumption practices, and how they prefer to learn about food safety. Researchers discovered that older men, older adults with higher incomes, persons with college educations, and older adults diagnosed with cancer, diabetes, and kidney disease would particularly benefit from food safety education programs. The population studied is more likely to suffer serious consequences from foodborne illnesses, but many of them consider themselves knowledgeable about safe food handling. However, after studying their responses and habits it was deduced that this was not the case. Many are not using good food safety behaviors and would benefit from food safety education specifically designed for the elderly. In developing the program, the following topics should be addressed: avoiding the consumption of store-bought deli salads; cooking eggs thoroughly; properly storing leftovers; reheating deli meats to steaming; using

thermometers when preparing meats, poultry and other foods; and utilizing thermometers to keep refrigerators at the proper temperatures. It is very important to educate older adults about listeriosis, an illness caused by the foodborne bacteria *Listeria monocytogenes*. This particular foodborne illness complicates the health of older adults, as many of them are already dealing with health difficulties. *L. monocytogenes* may be found on contaminated ready-to-eat products such as deli meats and fresh green salads, so the elderly should be instructed to heat ready-to-eat deli meats to steaming before consumption. In addition, such persons should avoid eating store-bought salads because these items cannot be heated for consumption, therefore any *L. monocytogenes* on the product will still be viable.

2.5 Cultural Differences Impact Effective Communication

Fraser and Alani (2009) reported that communication (including the language barrier) was an obstacle for practicing food safety. Pierce (2011) interviewed veterinarian Dr. Tim Fuhrmann, owner of Dairy Works (a management consultant firm located in Arizona), who suggested that non-English speaking individuals are commonly employed in the food and meat industries and that lack of good communication can complicate the effectiveness of food safety training programs. Fuhrmann indicated that, although there are communication issues due to language barriers, the culture of these immigrants must be better understood in order to effectively teach proper food handling practices.

Pierce identified ten cultural differences between American employees and Hispanic employees. By understanding these differences, communications can be improved between supervisors and employees. Differences discussed included capitalists versus socialists; efficiency is a foreign concept; family first; corruption happens; education is not a high priority; communication problems; a difference in standards; Spanish is the native language; money is not an issue; and differences in country dynamics. These differences can be described as follows:

Capitalists versus Socialists: Competition in the US compels business owners and their employees to always strive for improvement. Hispanics are accustomed to a socialistic world where equality is the goal. Therefore, the competitive natures of Hispanic individuals tend to subside as they become used to their current economic status.

Efficiency is a Foreign Concept: In the US it is very important to improve performance, whether it is in regards to business or pleasure. On the other hand, Hispanics are accustomed to earning the same wages regardless of their performance so they do not necessarily feel a need to become more proficient with their jobs.

Family First: US laborers generally appreciate their families, but occasionally some workers will place their obligations at work above family obligations. For Hispanics, their families are almost always the top priority.

Corruption Happens: Many Hispanics come from countries where corrupt businesses are not uncommon; therefore there are very high levels of mistrust when dealing with such firms. After

becoming accustomed to this type of business atmosphere, Hispanics may have more difficulty developing a level of trust with supervisors or coworkers. Working relationships will benefit when trust is developed between supervisors and their Hispanic employees.

Education is not a High Priority: Education is held in high esteem in the US, and high school students are encouraged to continue their educations upon graduation. Due to economic situations in many Latin countries, the focus on education is diminished. In many families, all capable members must work in order to help support the family. Unfortunately, many capable and talented Hispanic children sometimes are denied the opportunity to attend school due to these financial predicaments.

Communication Problems: In the US, most supervisors and employees have working relationships where employees feel comfortable asking questions so that they can correctly perform their jobs. In comparison, Hispanic people tend to become easily embarrassed, so a Hispanic employee may not feel at ease asking his supervisor questions. Therefore, he may only appear to understand instructions. It is very important not to embarrass Hispanic employees, but instead ask them if they understand their tasks using clear, simple terms.

A Difference in Standards: Cultural differences between US employees and Hispanic employees could affect how well assigned tasks are completed. Once again, Hispanic employees need to be shown how to do their jobs using clear instructions. In addition, by demonstrating to them how to do their jobs, they can more clearly understand how their performance ultimately affects overall production.

Spanish is the Native Language: Lack of communication is a major challenge when managing US and Latin American employees. The use of any Spanish language when communicating with Spanish-speaking employees is therefore considered a sign of respect because an extra effort is being made to communicate with them. When the most important goal of any food or meat manufacturing facility is to produce safe and wholesome products, providing clear instructions to receptive employees is vital.

Money is Not an Issue: In contrast to most US employees, Hispanic employees do not regard an increase in money (i.e. wages) as payment for a job well-done as highly. Instead, they value praise and recognition from their supervisors for doing a good job. This recognition is more important than monetary gain.

Different Country Dynamics: Hispanic laborers may come from any number of Latin countries and supervisors should recognize these differences. These employees should be put to work on tasks where they are best suited due to their personal strengths and cultural beliefs.

Fraser (2000) found that non-English speaking individuals do not learn the information if training is taught using the English-language. Based upon this information, it is very important to provide food safety education training programs in all necessary languages. Subsequently, improving safe food handling behavior begins by improving safe food handling knowledge.

2.6 Research Surrounding Food Safety Education for Non-English Speaking Populations

Madera, Neal, and Dawson (2010) studied diversity training in the hospitality industry and found problems occurring with increasing numbers of immigrants in the industry who have few communication skills. They found that the most effective way to teach preferred behavior to employees was by demonstrating the preferred behavior to them. In this study, language barriers prevented employees from understanding managers when directions and measurements were described. However, when the directions and measurements were demonstrated to them they understood. Food safety practices such as hand washing, how to cook to proper temperatures, and how to avoid cross contamination were also taught. Empathy was used as a tool to study how the non-English speaking employees learned. Some participants played the role of non-English speaking employees and soon realized how communication barriers can make employees feel stressed and lonely, which could lead to higher turnover rates in plants. In this study, 41 percent of the participants expressed these negative feelings.

Park, Kwak, and Chang (2010) examined a food safety training program that focused on employees' improved knowledge and proper food handling behavior. When questioned, employees rated themselves higher in food safety knowledge than they actually deserved. Employees also thought that they performed sanitation practices at high levels regardless of what they actually knew about proper sanitation. Researchers concluded that in order for employees to be proficient in performing proper sanitation practices, they must participate in more hands-on experiences that are correctly followed and meet specific standards and guidelines. In this research, the knowledge delivery was successful, but there was no evidence of behavioral change. Updated information about safe food handling must be shared with the employees and proper food handling practices of the employees must be regulated while they are on the job. Training must be continuous, practical, and taught on a level that the employees can understand. Additionally, employees must be motivated to continue learning about safe food handling.

Ratnapradipa, Quilliam, Wier and Rhodes (2010) concluded that the success of a food safety education program may be impacted by the methods used to teach the information. In this research, a group of immigrants were divided into two groups. One group was taught by their own bilingual children in their native language; the other group was taught in the English language by a certified food safety instructor. Individuals taught by their own bilingual children in their native language significantly improved their knowledge of safe food handling compared to those persons that were taught in the English language by the certified instructor. Comprehension and retention of the information significantly improved when individuals were taught in their native language. The successful learners felt more at ease learning from someone with whom they were more acquainted and felt more comfortable when asking questions about the information.

Brochette (1998) also researched a successful learning process when children taught preferred food handling behaviors to their own parents. These parents may have wanted to serve as good role models for their children when learning about these preferred methods. In addition, one-on-one training and shared experiences could have also influenced the effectiveness of this particular training. Brochette suggested that future investigations about teaching methods should use larger sample sizes and teach participants in their native languages. Other industries where non-English speaking individuals are employed could benefit from the findings of this research.

Erdem, Cho, Hertzman and Kitterlin (2009) studied the manner in which Hispanics preferred to learn about food safety. Four focus groups discussed barriers that prevented them from practicing safe food handling, their cultural beliefs, what they knew about food safety, the importance of good health, and how different learning styles affected the educational process. Focus group members stated that there were not as many food safety regulations in their home countries. They recognized there are important food safety rules in the US, and that they did a better job of recognizing and following those rules than workers from other countries. Members knew that bacterial contamination and questionable handling practices could cause illnesses when food was not cooked to proper temperatures. However, only a small number of them could name the proper final temperatures of cooked foods. They also recognized that food must be stored at correct temperatures. Allergens, molds and yeasts were not mentioned. Participants recognized that personal hygiene, particularly hand washing, was necessary in order to inhibit the transmission of bacteria. They realized that it was important to clean and sanitize tools and utensils, and that it was important for employees not to handle both food and money.

Participants stated that they learned a large majority of important information from health department videos, and while at their jobs. Implementing classroom lectures were the least effective method. Members indicated that they had little opportunity to use computers; therefore this group was skeptical about computer-based training. They would rather learn using visuals, especially if the task was demonstrated to them and then they were allowed to practice the skill. The food safety information that they learned while at their jobs was also practiced in their homes.

Boone et al. (2004) also studied what Hispanic populations knew about food safety. Hispanic newspapers, radio stations, television stations and friends received the most mentions with the common theme that Hispanics are most receptive to information when it is provided in their native language. This finding is in agreement with information gathered by the Food Marketing Institute (FMI). FMI profiled US Hispanic shoppers and found that 86 percent of them used English as their second language. It was found that 40 percent of those five years old and older did not speak English well (FMI, 1998).

Hispanics were questioned about cooking, cleaning, chilling, and separating foods and meats. Ninety-four percent of them knew to cook hamburgers to proper temperatures and 73 percent

used safe handling measures when serving food to large groups. However, only 34 percent knew how to properly defrost meat. Most of them incorrectly answered that it was appropriate to defrost meat on the counter or in hot water, instead of in the refrigerator.

Eighty-four percent correctly answered that contact surfaces must be cleaned after being touched, or touching, any other surfaces and 75 percent stated they knew to wash their hands after handling meat. However, only 31 percent knew to wash and rinse dishes in the correct temperature of hot water.

Concerning the proper refrigeration temperatures of foods, 75 percent knew that eggs should be refrigerated; only 46 percent recognized that frozen foods should be the last item purchased when shopping; and lastly, 23 percent knew that leftovers containing meat should be stored in shallow containers and refrigerated upon completion of meals to inhibit bacterial growth.

When questioned about separating foods, 93 percent knew that raw meats should be refrigerated and 85 percent knew to separate raw and cooked meats, poultry, and vegetables. Only 8 percent knew that frozen foods should be kept separate from all other foods.

Using a Likert scale of strongly agree, agree, undecided, disagree, or strongly disagree, Hispanics were questioned about their views on handling food safely. Individuals disagreed with the statement that they did not worry about food safety. In comparison, they strongly agreed on the following issues: concerns about food safety and their families; insuring that food is cooked correctly at home; and worries about food safety in the home.

Participants answered incorrectly when they strongly agreed with statements that people rarely become ill from food prepared in the home, and that the way a food smells can identify whether or not it is safe to consume. Individuals also incorrectly agreed that they could determine if a person became ill from eating particular food and if a person did become ill, it was due to food consumed at a restaurant. Most of the individuals either incorrectly agreed or were undecided that food served at community events and large dinners was safe to consume.

After reviewing all responses and their attitudes, the majority agreed that although persons should be concerned about food safety, it is talked about too much. With this in mind, additional effort must be applied to understanding Hispanics' and other ethnicities to determine what they indeed know and understand about food safety practices, how best to reach and teach these individuals, and develop the best practices to reach all ages about food safety. Researchers found that positive food safety behaviors established in Hispanic homes are likely to be practiced in the meat, poultry, and food industries where there is a large Hispanic workforce.

Gabbett (2011) interviewed Dr. Robert Gravani, Cornell University Professor of Food Science, and President of the Institute of Food Technologists for the *Meatingplace Magazine*, to discuss food safety education and training for farm workers, particularly non-English speaking individuals and their cultures. Dr. Gravani referenced work being conducted at Indiana University and

the University of Missouri where researchers are testing feedback on food safety messages delivered as public service announcements (PSAs). Focus groups have been developed using young Mexican-American families. Prior research has revealed that if individuals are responsible for preparing food for other persons, they make efforts to improve their food handling skills. Using the Spanish language, these young families are questioned about food safety and proper food handling behaviors; information gathered will be used to develop PSAs in Spanish. In addition, these studies have shown that children of immigrant laborers are especially receptive to story-telling techniques and coloring books that teach food safety behaviors.

Dr. Gravani also discussed the book "Why Employees Don't Do What They're Supposed To Do and What To Do About It" by Fournies (1999). In this book, 25,000 corporate employees were questioned as to why they left their jobs. Collectively, their reason was due to the lack of education. In other words, they felt that they had not been properly trained as to what, why, and how to do their jobs. Fournies explained that employees do not perform at preferred levels because they are not told why they should do so. In order for them to achieve higher performance, they must be shown how their actions or inactions affects their personal performance and that of the company. Supervisors must teach employees how to correctly do their jobs, and then ask them to demonstrate that they understand the instructions. Some employees may develop short cuts, supposing that they are making their tasks easier for themselves or saving the business money, when in fact neither is benefiting the company. Fournies writes that, "Preventative management is the intervention of manipulating elements in a specific work environment to bring about a predicated outcome that would not have happened without that intervention. It keeps things running right by denying people the opportunity to fail."

Gravani stated that most food safety issues are the result of lack of education, and/or lack of job training, which causes employee turnover. Poor training, inadequate sanitation, and the disregard of standard operating procedures have shown to be the root of reported food safety issues. GMPs such as changing gloves, proper cooking temperatures, and maintaining clean food contact surfaces must be taught, and the employees must make these new behaviors into new habits. By recognizing cultural differences, language barriers, and views on food safety, managers can develop appropriate approaches to teaching basic safe food handling practices. The concepts that Fournies wrote about may be easily implemented in teaching food safety in plants, other manufacturing systems, and in the classroom. Fournies commented on "preventative management" where, instead of dealing with management problems once they become apparent, supervisors put into place systems to circumvent situations that could develop into problems; a system very similar to the HACCP system now used in meat, poultry, and food manufacturing plants.

2.7 Models Studied in Food Safely Education Research

Methods to effectively teach about food safety have been investigated by several researchers due to the need for better safe food handling practices. Different models have been studied, identifying the preferred methods to use when teaching consumers and plant employees how to improve their meat, poultry, and food handling behaviors.

2.7.1 The Precede-Proceed Model

Green and Kreuter (1999) recognized a need to help individuals establish the safe food handling behaviors such as: avoiding cross contamination; avoiding work when ill; handwashing; and the reheating, proper cooling, and holding of food. They designed the Precede-Proceed Model using predisposing, enabling, and reinforcing factors that would help teach these improved behaviors.

Predisposing factors identify what people know and believe about foodborne illnesses; what they know about safe food handling and what behaviors they use when handling food; what type of risks they are willing to take that may cause a foodborne illness; how to control risks of contracting a foodborne illnesses; and what methods they can use to practice safe food handling.

Enabling factors identify situations where individuals can learn about safe food handling behaviors and put them into practice. Some form of food safety training is typically provided to individuals employed in the meat and food industries. It is important that the employees are provided proper equipment and space so that they can begin using the newly learned behaviors. Food safety manuals must be developed for use; a line speed that allows individuals the time to properly implement safe food handling practices; and training that matches the language and literacy of the employees so that proper instruction can be provided.

Reinforcing factors insure that these newly learned behaviors continue to be implemented. Employee attitudes, as well as the enforcement of safe food handling practices by management and co-workers, help to reinforce proper behaviors. Daily job stress and how employees are treated on the job can impact safe food handling education. Using a variety of employee incentives may impact the continuation of improved safe handling behaviors.

This research concluded that companies must be studied to determine how they focus on food safety and their perceptions surrounding safe food handling. Upon the completion of a food safety education program, the improved behavior of the employees must also be measured. All employees, managers, and supervisors must develop stakeholder attitudes in order to establish a food safety culture in the workplace. This stakeholder attitude implies that all departments and employees understand that their actions on the job impact the company and subsequently the industry; their actions at work will either positively or negatively impact their own households. By using employee empowerment, significant progress can substantiate efforts to ensure a safe food supply.

Green and Selman (2005) surveyed food and meat processing employees concerning their beliefs and self-reported practices at work. The following problems were identified: characteristics of the workers; emphasis on food safety by management and employees; food handling procedures used at restaurants; negative consequences for workers who do not adhere to safe food handling practices; the pressure of line speed and enough time to perform the job; work environment, equipment, and resources; and the use of gloves and sanitizers. Results showed that only providing food safety education is not sufficient; instead all aspects of food production and preparation must be considered. The problem areas reported by employees may cause them to be more amenable to participate in food safety education programs designed to help them be more successful with their jobs.

In another study, Green, et al. (2005) used telephone interviews to question employees about risky food preparation behaviors. Participants self-reported that they did not always wear gloves when touching ready-to-eat foods (60 percent); did not utilize a thermometer to check food temperature (53 percent); did not always change gloves or wash hands when working with raw foods (33 percent) and ready-to-eat foods (23 percent); and had come to work while sick with vomiting or diarrhea (5 percent).

However, safe food handling practices were also reported in this same study. Those responsible for handling ready-to-eat foods reported that they washed their hands and wore gloves more often than those who did not handle ready-to-eat foods. Employees responsible for cooking washed their hands and wore gloves more often than those who were not responsible for cooking. Older managers and workers were more likely to wash their hands more often than their younger coworkers. Chain restaurant policies mandated that their employees use thermometers more frequently to monitor temperatures in comparison to employees working in independently owned restaurants.

2.7.2 The Health Action Model

Rennie (1995) used the principles of The Health Action Model to develop an effective food safety program. This model is comprised of five systems: knowledge system, normative system, motivational system, belief system, and worksite environmental system. The knowledge and motivational systems were incorporated into a food safety educational program for Hispanic workers in the mushroom industry (Nieto-Montenegro, Brown, and LaBorde, 2008). By utilizing adult educational principles of hands-on activities and skill development, food safety lessons were learned (knowledge system). However, just as in the Greene research previously discussed, newly learned lessons must be reinforced so that proper behaviors are applied when in unfamiliar situations (normative system). Supervisors must make stringent efforts to practice proper food safety

behaviors, and insist that employees under their direction do the same. Supervisors must serve as role models to emphasize the importance of a food safety culture.

The motivational system is comprised of three components – expectancy, instrumentality, and valence. Expectancy refers to the enforcement of food safety basics by role models so that proper behavior can be monitored. In the study of Hispanics employed in the mushroom industry, the use of the expectancy model was effective. However, the company did not recognize proper food safety behavior being implemented (instrumentality model). Additionally, monetary incentives (valence model) were not accepted by the employees, although such enticements were provided.

Rennie concluded that normative systems (workplace rules and standards) and worksite environmental systems (physical makeup of the workplace) should be reviewed so that supervisory systems and management systems could be investigated. Challenges continue to arise as the behavior of workers is measured as they are being observed.

2.7.3 The Tones Action Health Model

The Tones Action Health Model (Rennie, 1995) combined two existing models – The Health Belief Model (Hockbaum, 1958) and The Theory of Reasoned Action Model (Fishbein, Middlestadt, and Hitchcock, 1994).

The Health Belief Model states that personal thoughts and perceived ideas about a particular disease will directly affect its occurrence. Seven areas comprise this model: perceived barriers, perceived benefits, perceived seriousness, perceived susceptibility, modifying variable, cues to action, and self-efficacy. This model alone could be implemented when teaching food safety education, as Gerba, Rose and Haas (1996) recognized that older adults are especially susceptible to foodborne illnesses. Hanson and Benedict (2002) reported that older adults feel threatened by foodborne illnesses even though they do not use safe food handling practices. Media coverage of foodborne illness outbreaks and safe handling instructions found on meat, poultry, and food product packaging serve as “cues to action” by receptive consumers when learning to use proper food handling practices.

The Theory of Reasoned Action Model combines a person’s attitudes, behavior, beliefs, and intentions. Researchers suggested that individuals’ attitudes and beliefs develop intended behaviors; subsequently, intended behaviors develop into actions due to the current environmental conditions.

2.7.4 The Food Hygiene Training Model

Seaman (2009) developed The Food Hygiene Training Model based on results of successful theories and models used in the health fields. This model combines components of The Tones’ Health Action Model (as it is applied to food hygiene education) and adds three important strategic components- stages of evaluation, managerial components, and measurements of performance.

The stages of evaluation are divided into three assessments. The training needs assessment is completed so that employees' initial capabilities may be measured and training needs can be identified. The employees are again assessed after training. A final assessment that is carefully planned and administered will accurately measure how well the new knowledge is retained. Further training needs may be identified at this time (Kirkpatrick, 1967).

Kirkpatrick suggests food safety training programs should be evaluated by the participants using questionnaires comprised of closed and open-ended questions. Evaluations can determine the value and relevance of the training in relationship to job expectations. The effectiveness of the training of employees and the effectiveness of training for the company can be obtained. Supervisors may assess employee effectiveness by interviewing employees after the training and evaluating food safety behaviors while on the job. The effects of training on the company may be evaluated by the review of customer reviews, product evaluation, records and reports, and test results.

Language must be considered when determining the best method to provide food safety training due to plant cultures and diversity of employees - regardless of the approach or model selected. It is also important to issue accreditation certificates to the participants upon their completion of the program. Seaman suggests that The Food Hygiene Training Model provides a framework that may be used by all meat, poultry, and food companies. The information learned in the training will improve the food safety knowledge and behaviors of their employees and may help reduce the incidences of foodborne illnesses.

Neal, et al. (2010) researched food safety education training assessment programs by using The Food Hygiene Training Model as the model for their program. This model was selected because of its thorough assessment: stages of evaluation, a system to manage the information, and methods implemented to evaluate overall performance of the program. Developed as an online training program, it was designed so managers could review food safety training material, participate in the training before providing the training to their employees, and decide which components of the material they wanted to teach to their employees. They could also decide whether the information learned for one job could be used in another job. Managers could complete the training at their own pace; in addition, gaps in training could be avoided because only the training needs at the time would be completed. Although taught online, the information should still be taught efficiently and thoroughly. The researchers suggested that those completing the program receive continuing education credits.

2.8 Summary

The goal of meat, poultry, and food manufacturers is to produce safe and wholesome products for the consumers, regardless of the languages that the employees in the industry speak and understand. Simply put – there are too many lives at stake. Developing food safety training programs in the learners' native language is of the utmost importance. Research has shown that

non-English speaking individuals will continue to become employed in these industries. Providing food safety training programs in their native languages is much more cost effective than enduring the ordeals caused by major product recalls. Future research should include methods to accurately measure improvements in safe food handling behaviors as a result of effective training programs.

Consequently, the first objective of this research was to assess a food safety training program taught in the English language to English-speaking individuals who were potential employees of a poultry processing facility. Evaluations were administered by using pre- and post-training assessments. It was hypothesized that noteworthy improvement would be realized when comparing the two sets of scores. Because this same facility hired a substantial number of non-English speaking individuals, the second objective of this research was to teach the same program in Spanish to Spanish-speaking individuals. Again, it was postulated that significant improvement would be evident between the pre- and post-training evaluations because the information was taught in the learners' native language. The third objective of the study was to compare the levels of improvement of the English speaking population to the non-English speaking population. Because each group learned the information by having it delivered to them in their native language, it would be hypothesized that successful results would be achieved by each group upon evaluating the training program assessments.

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CHAPTER 3. ASSESSMENT OF NATIVE LANGUAGES FOR FOOD SAFETY TRAINING PROGRAMS FOR MEAT INDUSTRY EMPLOYEES

A paper accepted for publication in the Journal of Extension

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Abstract

Challenges arise when teaching food safety to culturally diverse employees working in meatpacking and food manufacturing industries. A food safety training program was developed in English, translated into Spanish, and administered to 1,265 adult learners. Assessments were conducted by comparing scores before and immediately following training. Scores concerning food safety knowledge and food handling behavior improved dramatically when training was conducted in the native language. Impressive gains were noted for Spanish-speaking participants who averaged 96.60% on post-training scores, demonstrating that identical food safety training programs are most successful with both English- and Spanish-speaking individuals when presented in their native languages.

Introduction

Recognizing that the numbers of non-English speaking laborers employed in meatpacking and food manufacturing industries will continue to grow (Po, Bourquin, Occeña, and Po, 2011), it is evident that these individuals must learn safe food handling behaviors and methods. This study examined the extent to which a food safety training program developed in the English language and taught to English-speaking individuals would be as effective when translated into the Spanish language and taught to Spanish-speaking individuals in their native language.

Recently updated information has shown that foodborne diseases caused by known and unknown pathogens total 47.8 million illnesses, 127,839 hospitalizations, and 3,037 deaths annually in the United States (Scallan, et al., 2011). While much of the responsibility for preventing foodborne illnesses and deaths lies in safe food handling in the home (Marsden, 2009), the food processing industry bears major responsibility for ensuring safety of commercially available food products, and employee training in food safety is a critical element in meeting that responsibility. The meatpacking industry in the United States relies heavily upon non-domestic workers who are typically non-English speaking individuals. From 1980 to 2000, non-Hispanic Caucasian employees in meatpacking plants decreased from 74 to 49 percent, whereas the Hispanic workforce increased from 9 to 29 percent. In this same time span, the number of Hispanics born outside of the United States and entering this work force increased from 50 to 82 percent of the Hispanic group. With this rapid influx of non-English

speaking persons into the food processing sector, instruction and training in proper food handling have become especially problematic (Kandel, 2006).

Although food processors continue to develop and improve methods of safe food production (Jol, Kassianenko, Oggel, and Wszol, 2006), proper food handling techniques can be difficult to teach to individuals when native language is not used, such as Spanish-speaking laborers in an English-speaking work environment (Nyachuba, 2008). Employee training programs must emphasize the importance of safe food, implement effective manufacturing practices, and enforce standard operating procedures in the plants so as to provide safe and wholesome products (Mikel, White, and Senne, 2002). These programs must be designed using proven educational methods and meet the needs of the diverse cultures comprising the work force of these plants. Attention must be given to the communication skills and educational levels of all employees, including the growing non-English speaking population employed in these industries. A food safety curriculum designed to teach bilingual youth has been shown to provide successful training when the material was translated to the Spanish language (Hoover, Cooper, Tamplin, Osmond, and Edgell, 1996).

Methods

Company trainers, Extension Specialists, and university personnel devoted significant time in a series of planning meetings for the development of pre-employment food safety training programs that were taught in both English and Spanish languages for a major Midwest meat processing company. The program curriculum was developed based on a food safety handbook written by a nationally recognized corporation that provided program modules on allergens, bacteria, cross-contamination, foodborne illness, foreign material detection, personal hygiene, pest control, sanitation, security, and time and temperature. Six videos addressing cross-contamination, foodborne illnesses, microorganisms, personal hygiene, and sanitation were utilized for instruction. Individuals participated in activities that taught proper handwashing methods and differences that exist between poisons and sanitizers. Weekly training sessions were taught in a classroom at a plant on two mornings in succession. At the conclusion of the training, individuals considering employment were required to achieve a 70% score on a 65-question multiple-choice certification exam that measured their comprehension of the material. The exam questions were taken from quizzes included in the food safety handbook.

A confidentiality statement was provided to the participants immediately prior to the training, and demographic information was collected: age, education, native language, gender, years of food service experience, and whether the participant was a re-hire for the company. To assess comprehension of the information, two documents (a pre-training assessment and a post-training assessment) were developed using 20 multiple-choice questions from the certification exam, focusing on both knowledge and behavior. Both documents were comprised of the same questions, although

the questions were randomized in each document. All training and assessments were done in English for English-speaking participants and in Spanish for Spanish-speaking participants. Both versions of training and assessment were written with careful attention to likely literacy levels that might be encountered. Data was analyzed using the General Linear Model (GLM) procedure with contrasts (SAS, version 9.1; SAS Institute, Incorporated, Cary, North Carolina). $P < 0.05$ was the standard for significance.

The knowledge questions included:

- Ways to control bacteria in food include:
- Which bacteria can be controlled by time and temperature?
- The temperature “Danger Zone” is between:
- Disease caused by harmful bacteria in food is called:
- The most important personal hygiene practice to control the spread of bacteria is:
- Which control measures help prevent foreign materials from getting into food?
- Bacteria can cross contaminate food by hitching a ride on:
- Sanitation refers to:
- Pests are attracted to:
- Bacteria are found in:

The behavior questions included:

- If you think a time or temperature control may have been violated:
- To prevent chemical cross contamination always:
- To prevent bacterial cross contamination always:
- When wearing personal protective equipment (PPE) you should:
- Good personal hygiene practices include:
- When working with foods that contain allergens:
- Which is **not** a good personal hygiene practice?
- Visual inspection means:
- To make sure time and temperature controls are met:
- You must always wash your hands after:

Results

Demographics of the 1,265 participants that completed both the pre- and post-training assessments are shown in Table 1.

Table 1.

Demographic Information of Participants Completing
Food Safety Pre- and Post- Training Assessments

Variable	Percent
Gender	
Male	58.81
Female	41.19
Native Language	
Spanish	20.79
English	79.21
Reported Age (Years)	
Younger Than 20	9.43
20-29	42.66
30-39	26.12
40-49	16.07
Equal To or Greater Than 50	5.72
Education-English	
11 th Grade or Less	11.10
High School Diploma/General Education Development (GED) Certificate	51.10
Some College/Vocational Technical Courses	23.90
Vocational Technical Certificate	5.10
Associate or Advanced Degree	8.50
No Response	0.30
Education-Spanish	
Grades 1-6	34.99
Grades 7-9	31.94
Grades 10-12	19.77
Some College/Vocational Technical Courses	4.18
College/Vocational Technical Certificate	2.28
No Response	6.84
Food Service Experience (Years)	
None	22.92
Less Than 1	20.16
1-5	38.18
Greater Than 5	17.08
No Response	1.66
Re-hire for the Company	
Yes	7.83
No	88.38
Current Employee	1.50
No Response	2.29

Table 2 contains results from pre- and post-training assessments for knowledge and behavior questions.

For knowledge questions, the Spanish-speaking group significantly ($P < 0.05$) improved their mean scores by 50.56 percentage points, compared to an improvement of 13.38 percentage points ($P < 0.05$) for the English-speaking group. Initially, the English-speaking group had a mean score of 83.5% and the Spanish-speaking group had a mean score of 42.67%. The post-training assessments showed the mean scores of the Spanish-speaking group (93.23%) were within 3.65 percentage points of the mean scores of the English-speaking group (96.88%).

For behavior questions, the Spanish-speaking group also improved their mean scores significantly ($P < 0.05$) by 34.56 percentage points, compared to an improvement of 5.79 percentage points for the English-speaking group. On the pre-training assessments, the English-speaking group had a mean score of 91.41% and the Spanish-speaking group had a mean score of 58.61%. The post-training assessments showed the mean scores of the Spanish-speaking group (93.17%) were within 4.03 percentage points of the mean scores of the English-speaking group (97.20%).

A review of the mean scores for all questions provides revealing information. The English-speaking group achieved a mean score of 88.46% on the pre-training assessment while the Spanish-speaking group mean score was 55.61%. The English-speaking group had a mean score that was 32.85 percentage points higher on the pre-training assessment.

However, the English-speaking group achieved a mean score of 98.68% on the post-training assessment while the Spanish-speaking group achieved a mean score of 96.60%. Following the training program, the Spanish-speaking group had a mean score that was only 2.08 percentage points lower on the post-training assessment.

The high initial scores by the English-speaking group may reflect a greater familiarity with food safety issues among the English-speaking participants due to media coverage of these issues in the United States.

Impressive improvement was made by the Spanish-speaking group by training in the Spanish language. They increased their overall mean score 40.99 percentage points when pre- and post-training assessment scores were compared (compared to 10.22 percentage point improvement for the English-speaking group).

Table 2.
Comparisons of Scores
Food Safety Pre- and Post-Training Assessments

Variable	Mean (SD) Pre-training	Mean (SD) Post-training
Knowledge Questions		
<i>Native Language</i>		
Spanish	42.67 ^a (27.5)	93.23 ^b (19.4)
English	83.50 ^a (17.0)	96.88 ^b (13.3)
Total	74.21 ^a (26.2)	96.05 ^b (15.0)
Behavior Questions		
<i>Native Language</i>		
Spanish	58.61 ^a (29.7)	93.17 ^b (19.5)
English	91.41 ^a (15.5)	97.20 ^b (13.3)
Total	83.95 ^a (23.9)	96.28 ^b (15.0)
All Questions		
<i>Native Language</i>		
Spanish	55.61 ^a (22.7)	96.60 ^b (6.4)
English	88.46 ^a (12.1)	98.68 ^b (3.5)
Total	81.63 ^a (20.0)	98.25 ^b (4.3)
^{a, b} means within a row with different superscripts are significantly different (P < 0.05)		

Discussion and Recommendations

Because of the importance of manufacturing safe products, food safety training programs must be taught to all employees in food manufacturing and meat processing plants. Rennie (1994) evaluated employee food hygiene education courses taught in food manufacturing industries and concluded that the most effective training sessions were held at the worksites. It should be noted that the training principles and techniques employed in this study have much broader potential application than the meat and food industry. With the influx of non-English speaking laborers into the English-speaking workforce of many industries, the results of this study have application to virtually any industry and any non-English language.

Extension Specialists and trainers must communicate with the Hispanic population by using bilingual aides and Spanish-speaking educators, and present materials in English and Spanish to be most effective (Farner, Cutz, Farner, Seibold, and Abuchar, 2006). Results of the present study indicate that food safety training programs translated to the Spanish language and taught to adult Spanish-speaking learners were highly effective. This study addressed adult learner issues as follows: identify needs, define objectives, identify learning experiences to meet objectives, organize learning experiences into plans, and evaluate program outcomes (Brookfield, 1986).

Significant increases in food safety knowledge and an understanding of proper food handling behavior by the Spanish-speaking group was realized as a result of this training. The improvements in scores are even more impressive when reviewing the educational levels of both groups - 66.93% of the Spanish-speaking group had completed grade 9 or less in their education; 88.90% of the English-speaking group had earned their high school diploma/GED certificate or more in their education. This confirms that the curriculum has been designed to effectively reach the participants on a level that they are capable of comprehending. In addition, by translating that material to the Spanish language, individuals were effectively taught the proper procedures and behaviors to implement when handling food and meat products. The program and materials developed during the course of this study are now being used in a large-scale training program by a major meat processing firm.

Food and meat recalls are serious matters. Not only could consumers be placed into potentially dangerous situations, recalls are expensive and can drive companies out of business as a result of losing public trust. Successful food safety training that utilizes successful adult learning methods and accommodates differences in language and education will help to ensure that all safety measures are being used by employees to manufacture safe, wholesome food and meat products. Curriculum development, teaching, and assessing food safety training programs for plant employees in their native languages should be initiated and continued. Trainers should be cognizant of differing levels of education as this may directly affect how well these adults learn. In this study, individuals were taught about safe food handling and proper behaviors to use when handling food. Distinct differences exist between knowing about proper safe food handling and actually developing new habits that implement those practices in the manufacture of safe food and meat products. Production line cameras and monitoring the use of soap dispensers are two examples that may be valuable to ensure that a food safety culture has been achieved.

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CHAPTER 4. GENERAL SUMMARY AND CONCLUSIONS

For years, students of the social sciences have studied about the waves of people from other countries who arrive in the United States looking for economic and/or lifestyle opportunities. Sometimes these individuals remain, and sometimes they find what they are looking for and then return home. Those who decide to stay forever change the communities in which they settle.

These immigrants bring with them challenges – and for many of them it is their inability to communicate in the English language. Their inability to read, write, or speak the English language makes it particularly difficult for them to perform their jobs effectively. Many find manual labor jobs that require limited skill sets, albeit these are low wage jobs. Therefore, while working at these jobs, many of these men and women continue looking for higher paying jobs which may require them to migrate from community to community. Many find work in the agricultural industry, and in this study immigrant workers in the meatpacking industry were studied.

A food safety education program was offered in both the English and Spanish languages for potential employees of a poultry processing plant. Knowledge questions and behavior questions were asked of both groups in the pre- and post-training assessments. Considering the knowledge questions, the Spanish-speaking group improved their mean scores by 50.56 percent ($P<0.05$) following the training program while the English-speaking group improved their mean scores by 13.38 percent ($P<0.05$). For the behavior questions, the Spanish-speaking group improved their mean scores by 34.56 percent ($P<0.05$); the English-speaking group improved their mean scores by 5.79 percent ($P<0.05$).

The English-speaking group achieved a mean score of 88.46 percent on the pre-training assessments, and subsequently earned a mean score of 98.68 percent on the post-training assessments. The Spanish-speaking group had a mean score of 55.61 percent on the pre-training assessments. However, after completing the program in the Spanish language, they earned a mean score of 96.60 percent on the post-training assessments.

Especially noteworthy is that the Spanish-speaking group had a 40.99 percent increase in their mean score when comparing their pre- and post-training assessments. The English-speaking group had a 10.22 percent increase in the mean score when comparing the pre- and post-training assessments. The Spanish-speaking group essentially reached the same level of achievement as the English-speaking group in the post-training assessments.

Clearly, success can be achieved in learning safe food handling information if a well-designed program is taught in the individuals' native language, regardless of the education attained by the individuals. This hypothesis was proven to be true upon analysis of the data collected in this study. Although this particular group of Spanish-speaking individuals lagged behind the educational levels attained by the English-speaking individuals, they most certainly demonstrated their abilities to score as well as their counterparts on the post-training assessments. For the Spanish-speaking

individuals, 34.99 percent had completed grades 1 – 6; 31.94 percent had completed grades 7 – 9; and 19.77 percent had completed grades 10 – 12. In comparison, 11.10 percent of the English-speaking individuals had an 11th grade education or lower; and 51.10 percent had earned a high school diploma and/or a General Education Development (GED) Certificate. The proof may be found in the results – even with as little as a first grade education, Spanish-speaking individuals can successfully learn new information if they are simply taught in their native language utilizing appropriate educational methods and providing them the opportunities to develop the skills needed to meet the demands of their work.

Finally, while research has suggested that although participants (regardless of nationalities) experience success in completing these training programs, many fail to practice the preferred handling methods. For many individuals, differences in cultures affect their willingness to change age-old habits. Therefore, in addition to continuing education programs about food safety, as the next step in this research, procedures must be developed that accurately evaluates behavioral changes of all plant employees following food safety education training programs. Food safety education must adapt to improved educational methods and updated food safety protocols so that persons of all nationalities and cultures can effectively learn the information and implement those tools in the workplace.

Ruben Navarrette Jr., a CNN Contributor, is quoted as saying, “Regardless of their backgrounds or biographies or biases, Hispanics want what the rest of their countrymen want: the chance to work for a brighter tomorrow, the right blend of rights and responsibilities and the respect that comes from being seen as individuals and not just part of a group. And why not? That’s the American way.” (CNN Opinion, <http://www.cnn.com/2011/09/15/opinion/navarrette-hispanic-america/index.html>).

ACKNOWLEDGEMENTS

Thirty years ago I was a graduating senior at the University of Missouri-Columbia, and couldn't wait to leave Columbia and begin an exciting career in the purebred cattle industry at the American Shorthorn Association in Omaha, Nebraska. However, we all grow and change, become married, establish families and careers, and somewhere along the way finally decide upon a life's vocation.

At the urging of Dr. Brad Skaar, I made the decision to attend graduate school at Iowa State University to study animal and meat science and become involved with the teaching program. In August 2002 I began this passage – one of the most gratifying processes which I've experienced. I've been provided opportunities to work with many accomplished faculty and professionals in the livestock and meat industries, as well as interact with hundreds of young men and women with the same passions. It has most certainly been a worthwhile journey.

I would like to extend my appreciation to my husband Roger, as this work is as much his as it is mine. He has supported me throughout the course of my graduate work, and it is hard to believe that it's been 10 years in the making! My dad, Bill Coats, and my mom, Carolyn Sue Coats, instilled in me the belief that I could do anything (although I am certain that I inherited the bull-headedness from Daddy). Adele, Shawn, Travis, and their families have always been supportive of my change in careers. I would be remiss if I didn't also recognize the love and support from Donald and Mary June Coats, and Rowland and Sarah Russell, my paternal and maternal grandparents, who were all heavily involved in the growth and development of me, my brothers and sister, and nieces and nephews.

Thank you to my graduate committee for all of the knowledge, support, and suggestions imparted to me as I successfully completed the Masters and PhD programs at Iowa State University. I would also like to thank the Department of Animal Science faculty, graduate students, undergraduates, and support staff.

Dr. Armitra Jackson Davis - you're my "sister of another color". I love you and appreciate the encouragement that you've provided to me throughout the years. I still remember the first day I met you – I had to encourage you to buy a good winter coat, and you informed me you were having baked chicken and rice for supper - I knew that we'd get along right from the start!

And finally, thanks to my Lord and Savior Jesus Christ, who has led me through this decade and provided me the strength necessary to sustain each day's challenges. May He consider this season of my life successful.