THE IMPACT OF AUDIENCE DISPOSITION ON PRO-GMO ADVERTISEMENT EFFECTIVENESS: AN APPLICATION OF THE ELABORATION LIKELIHOOD MODEL

THESIS

Presented in Partial Fulfillment of the Requirements for the Degree Master of Science in the Graduate School of The Ohio State University

By
Xuerong Lu, B.E.

Graduate Program in Agricultural and Extension Education

The Ohio State University

2016

Master's Examination Committee:
Dr. Emily Buck, Advisor
Dr. Annie R. Specht
Abstract

The genetic modification (GM) development brings out a considerable interest and public controversy around the world. Various American and international studies have described the status of the public’s acceptance of genetically modified organisms (GMOs) in the past 10 years. Other studies were also conducted to understand how the mediators like risk perception and demographic characteristics work in the public’s rejection of GMOs. However, the studies related to individuals’ behavior in processing pro-GMO advertisements are sparse. As an important part of GMOs promotion activity, the effectiveness of advertisements is the key to the success of campaign. There is a need to explore the interaction between audience and persuasive messages of GM food products during both active and passive message processing. Understanding how customers self-evaluate genetically modified organisms (GMOs) and how they react with pro-GMO persuasive message of different formats would help improve the efficacy of scientific communication.

Based on the framework of the Theory of Planned Behavior and the Elaboration Likelihood model, this study concentrates on the decision-making process of young and potential consumers, who have moderate involvement. The purpose of this study was to
explore how customers engage in the PRO-GMO advertisement based on their pre-existing knowledge about GMOs.

A descriptive survey was mailed electronically to a sample of 352 students who enrolled at Ohio State University in the 2016 spring semester. Of the 48 surveys returned, 43 were completed.

Respondents reported a slight positive attitude toward GM food products. Young consumers believed that GM food products might be good based on the promised safety, higher quality, and social responsibility. As a result, they were more likely to be actively exposed to pro-GMO messages and less likely to disparage related messages. If exposed passively to the pro-GMO messages, they were also likely to positively evaluate them. In spite of a favorable attitude towards GMOs, respondents reported a more negative behavioral intention to purchasing them. They were not willing to buy it at once though they quite agree with the content of pro-GMO advertisements. In addition, in the GMO issues, images are more powerful in attracting audiences, while text is more powerful in convincing audiences.

Based on the effect of different communication channels on GMO-related attitude formation in this study, there is a need for researchers to explore how young consumers discuss GMOs and related topics in the channel like social media. Based on the finding of the gap between attitude and intention, future research should be conducted to explore how other factors practically function in the attitude and behavior gap. Besides other recommendations made for future research, the researcher also suggests how educators,
communicators, and advertisers could improve their campaign strategy based on the results of this study.
Dedicated to my parents who provide unconditional love and encourage
Acknowledgments

During the period of writing thesis, I got the abundant favors from many individuals. I would like to express my sincere gratitude to my advisor Dr. Emily Buck for the continuous support of my research, for her wisdom, motivation, patience, enthusiasm, and immense knowledge to help me developing the research and to critique the drafts. Her guidance in communication study learning and conducting researches was invaluable during my master study period spent at the Ohio State University. As well, I thank him for offering me the opportunities to realize what the communication study is. I would also like to thank the members of my committee, Dr. Annie R. Specht, for her encouragement and insightful comments. I am so grateful to work with them.

I am thankful for the opportunities to act as a graduate student in the Department of Agricultural Communication, Education, and Leadership, working and studying with faculty and student here.

I would also like to thank to Dr. Caryn Filson, Dr. Jeffrey Firkins, Dr. Karen Elekes, Dr. Ryan W. Norris, Mr. Thomas S. Stewart, and Ms. Vicki Garrett for their support of the study and permission to survey the students in their class.
My parent, Lu Lu and Ling Wu, have provided unconditional support during this process. I am appreciative for their inspiration which let me brave enough to reach my goals.
Vita

August 26, 1991 .............................................Born – Shanghai, China

2010 - 2014 ....................................................B.E. Food Quality and Safety, Jinan University, Guangzhou, Guangdong Province, China

2014 to present  ..............................................Graduate Student, Department of Agricultural Communication, Education, and Leadership, The Ohio State University

Fields of Study

Major Field: Agricultural and Extension Education

Area of Emphasis: Agricultural Communication
Table of Content

Abstract ............................................................................................................................... ii
Dedication .......................................................................................................................... v
Acknowledgments .......................................................................................................... vi
Vita ................................................................................................................................... viii
List of Figures ................................................................................................................ xii
List of Tables .................................................................................................................. xiii

Chapter 1 : Introduction .................................................................................................. 1

History and Background of Genetically Modified Food ................................................ 3
Popularity of Genetically Modified Crops in the United States ..................................... 4
Debates Related to Genetically Modified Food Products ............................................. 5
Communication Influence ........................................................................................... 7
Statement of the Problem ............................................................................................... 9
Purpose of the Study ...................................................................................................... 10
Research Objectives .................................................................................................... 12
Limitations ..................................................................................................................... 12
Definition of Terms ...................................................................................................... 13

Chapter 2 Literature Review ........................................................................................... 14

Attitude-Behavior Consistency ..................................................................................... 16
The Elaboration Likelihood Model of Persuasion ....................................................... 17
The Application of Elaboration Likelihood Model ....................................................... 20
Food Consumption Concern ................................................................. 21
The Effects of Matching on Persuasion ............................................... 24
The Application of Matching Effect ....................................................... 27
Summary ............................................................................................ 30

Chapter 3 Method .................................................................................. 32
Research Design ................................................................................... 34
Subject Selection .................................................................................. 34
Instrumentation .................................................................................... 36
Measures ............................................................................................... 36
Variables ............................................................................................... 39
Reliability .............................................................................................. 44
Data Analysis ......................................................................................... 46
Summary ............................................................................................... 48

Chapter 4 Results .................................................................................. 49
Objective 1: To describe how an individual forms predispositions toward genetically modified Organisms (GMOs) by self-evaluating the safety, quality, and social functions of GMOs. ................................................................. 52
Objective 2: To describe how the audience’s predisposition toward GMOs influences the effectiveness of persuasive messages when audiences are exposed to the message. ......................................................... 58
Objective 3: To describe the difference in effectiveness of messages by their formats. ................................................................. 63
Post Hoc Analysis of Advertisement Effectiveness .............................. 65
Summary ............................................................................................... 67

Chapter 5 Discussion ............................................................................. 68
Conclusions ............................................................................................ 69
Objective 1: To describe how an individual forms predispositions toward genetically modified Organisms (GMOs) by self-evaluating the safety, quality, and social functions of GMOs. ................................................................. 69
Objective 2: To describe how the audience’s predisposition toward GMOs influences the effectiveness of persuasive messages when audiences are exposed to the message. ......................................................... 72
List of Figures

Figure 2-1. The Elaboration Likelihood Model ........................................................... 19

Figure 3-1. The Model of Research Design ............................................................... 39
List of Tables

Table 2-1: Four functions which a attitudes perform for the individual (Adapted from Katz, 1960)................................................................................................................................. 26

Table 3-1: Subject Selection............................................................................................................. 35

Table 3-2: Example of a Predisposition Formation Scale Item ................................................ 40

Table 3-3: Example of an Attitude Scale Item.................................................................................. 41

Table 3-4: Example of statements for Selective Exposure............................................................... 42

Table 3-5: Examples of Selective Perception Scale Items .............................................................. 42

Table 3-6: Example of Questions Related to Response................................................................. 43

Table 3-7: Cronbach's Alpha Reliability Coefficients for Predisposition Formation Scale
............................................................................................................................................................................ 44

Table 3-8: Cronbach's Alpha Reliability Coefficients for Selective Perception Scale .... 45

Table 3-9: Cronbach's Alpha Reliability Coefficients for Evaluation Scale.............................. 46

Table 4-1: Demographic Characteristics of Participants............................................................... 51

Table 4-2: Information Source......................................................................................................... 53

Table 4-3: Mean for Importance of Communication Channels (7 Items)................................. 54
Table 4-4: Mean for self-evaluated predisposition towards GMOs ........................................ 55
Table 4-5: Mean for Predispositions toward GMOs and their corresponding variable .... 56
Table 4-6: Consideration of Safety, Quality, and Social Responsibility Related to Overall Attitudes toward GMOs ....................................................................................................................... 58
Table 4-7: Audience’s Preference for GMO-Related Topics .................................................. 59
Table 4-8: Mean for Selective Perception ........................................................................... 60
Table 4-9: Correlation between Pre-existing attitudes and Selective Perception ............ 61
Table 4-10: Evaluation of pro-GMO Advertisement ............................................................. 62
Table 4-11: Correlation between Predisposition toward GMOs and Evaluation of the pro-GMO Advertisements ......................................................................................................................... 63
Table 4-12: Reaction to Different Components of Advertisement ........................................ 64
Table 4-13: Attitude Change and Behavioral Intention after Reading the Advertisement ..................................................................................................................................................................... 65
Table 4-14: Post Exposure Attitude towards GMOs ............................................................. 66
Chapter 1: Introduction

The technique of genetic modification (GM) was commercially applied in agriculture in 1996 and quickly became an indispensable component of agricultural biotechnology. Until September 2013, U.S. farmers’ adoption of first-generation genetically engineered (GE) crops—varieties enhanced inputs such as herbicide tolerance and insect resistance—has occupied about 90% of the planted area of corn, soybeans, and cotton. Moreover, the number of field releases for testing of GE varieties approved by USDA’s Animal and Plant Health Inspection Service (APHIS), a measure of research and development activity of GE crops, has already reached about 7,800 releases for GE corn, over 2,200 for GE soybeans, more than 1,100 for GE cotton, and about 900 for GE potatoes. Releases approved for GE varieties with herbicide tolerance, insect, resistance, flavor and nutrition and drought resistance were 6,772; 4,809; 4,896; and 5,190 release separately (USDA, 2014).

Under the circumstance of increasing global population, massive hunger in developing nations, an estimation that a child dies for every two seconds worldwide from starvation and numerous people who are malnourished and undernourished, the use of GM technology would bring numerous benefits to not only farmers and consumers, but
also societies worldwide. Advantages of GM technology mentioned in thousands of studies included bigger yields to create more efficient use of land and to feed the world; higher seed quality with higher resistance to weeds, pest and other diseases; higher product quality with better texture, flavor, nutritional value and even shelf life; and positive environmental impacts like less use of herbicides and other pesticides (Edwards, Faeber, Goenawan, & Osawa, 2005).

However, several studies pointed out that consumers were more willing to pay a premium for foods without GM ingredients, especially in industrialized nations like the United States of America and European countries (USDA, 2014). The debate of advantages and disadvantages of GMOs is still continuing. In spite of the fact that GE crops are as safe as or even much safer than any other conventional or organic crops, some people remain uncertain about it and believe more research needs to be done ("What Are the Advantages and Disadvantages of GM Seeds," n.d.). Some people worry that GE crops would lead to herbicide-resistant weeds or pesticide resistant insects (NRC, 2010, p. 213). As a result, serious threats might be taken to the farms. Some consumers reject food produced with GM ingredients simply because the name of it—including GMO and genetically engineered – sounded as threatening to consumers ("What Are the Advantages and Disadvantages of GM Seeds,” n.d.).
History and Background of Genetically Modified Food

At the dawn of human civilization, ancient people started to domesticate wild animals for sources of food and tools in order to survive in the natural world. For example, early humans domesticated cows for milk and mules for burden. By about 8000 BC, residents of Mesopotamia realized that plants could also be domesticated (Newton, 2014). Several millennia after the domestication of wild beings, ancient people started to create new plants and animals that could not be found in nature by cross-breeding two different species. This so-called process of “hybridization” is regarded as the first level of genetic modifications. About 2000 BC, a new strain, Oryza Sativa Indica, was produced by hybridizing Oryza sativa japonica (rice native to Japan) on the Indian subcontinent (Newton, 2014). Since then, hybridization techniques have been popular among agricultural workers to improve the quality of domestic plants for more than 3,000 years. It was not until the 1800s that scientists started to explore the scientific explanation for the hybridization process. With the work of Gregor Mendel, the Friedrich Miescher’s discovery of deoxyribonucleic acid (DNA), and help from some other following researchers exploring the components of the DNA molecule, enough information had accumulated to draw a complete description of a DNA molecule and to understand what a gene was by the early 1950s. Researchers then realized that the gene, a locus on a functional protein, consists of amino acids, which were directly produced by nitrogen bases. These special proteins are responsible for a specific genetic trait like blue eyes or
red hair. They can work alone or in combination with other proteins. The process of using organisms with desired characteristics to breed the next generation is the process of selecting and transmitting desired genes. Specifically, during the process of genetic engineering, scientists first decided the certain physical or biological characteristics of the plant they wanted to change and then, located the according genome code by sequencing it (Newton, 2014).

**Popularity of Genetically Modified Crops in the United States**

The technique of genetic engineering (GE) was commercially applied in agriculture in 1996 and quickly became an indispensable component of agricultural biotechnology. Genetic engineering alters genes that have the particular traits needed to be changed. The altered traits can be classified into one of three generations: enhanced input traits, value-added out traits, and products beyond traditional crops for special uses. In the past 15 years, U.S. farmers’ adoption of first-generation GE crops varieties—enhanced inputs such as herbicide tolerance and insect resistance—has occupied about 90% of the covered area of corn, soybeans, and cotton. Herbicide tolerant (HT) crops and Insect-resistant (Bt) crops are two dominant planted GE crops in the U.S. HT crops can endure highly effective herbicides like glyphosate, allowing farmers to control weeds effectively. Crops like soybeans, corn, cotton, and canola have this trait. Bt crops can produce a two insecticidal proteins by its engineered gene (a gene from the soil bacterium, *Bacillus thuringiensis*) and is available to corn and cotton. Corn, cotton, and soybean are the three
main crops in the GE markets. Specifically, the planting of HT soybeans grew from 54% of soybean acres in 2000 to 87% in 2005 and 93% in 2013. HT cotton was planted 82% of cotton acres in 2013, which was planted 46% of cotton acres in 2000 and 61% in 2005. HT corn was planted 85% of corn acres in 2013, which was planted 7% of corn acres in 2000 to 26% in 2005. Meanwhile, Bt cotton increased from 35% of the cotton acres in 2000 to 75% in 2013 (USDA, 2014).

As the measure of research and development activity of GE crops, the number of field releases for testing of GE varieties approved by USDA’s Animal and Plant Health Inspection Service (APHIS) also represents the powerful market of GE crops. The number of releases grew from 4 in 1985 to 1,194 in 2002 and averaged around 800 per year thereafter. And then it jumped from 1,043 in 2005 to 5,190 in 2013. Until September 2013, about 7,800 releases were approved for GE corn, more than 2,200 for GE soybeans, more than 1,100 for GE cotton, and about 900 for GE potatoes. Releases approved for GE varieties with herbicide tolerance, insect, resistance, flavor and nutrition and drought resistance were 6,772; 4,809; 4,896; and 5,190 release separately (USDA, 2014).

**Debates Related to Genetically Modified Food Products**

The recombinant DNA technology makes it possible to create crops with desired properties. However, the controversial discussion about whether genetically modified (GM) food products can be consumed by humans is heating up even more today as people become concerned about the safety of their food. The key conflict is between
genetic engineering scientists or agri-biotech investors and potential consumers. The former support that the GM food product can do good to both human beings and society due to its high quality and safety, while the latter reject it due to its unknown but possible risks like food allergies and loss of biodiversity (Panse, 2014).

GMO opponents believe that GM food products are risky because several scientific studies have indicated that animals have been harmed or even died after being fed by GM crops (Sarich, 2013). However, some GMO supporting scientists point out that the adverse effects found in the one-off studies of lab animals are not extremely significant. According to the field data represented, after the introduction of GM food products, about the number of animals which was 100 million before 1996, was jumped to 90% after not feeding 100% non-GMO. Besides, there was no evidence indicating that any unusual trends happened in the health of animals, or that GM feed had the same safety promise and nutrition value as non-GMO feed did (Entine, 2014). In addition, GMO opponents claim that GM food products may lead to food allergies by raising the incident of foodborne diseases in the USA and UK. However, scientists argue that the increasing tendency of foodborne diseases appeared before 1996, the introduction of commercial GMOs (Entine, 2014).

GM advocates point out that the mechanism of genetic engineering is the same as conventional breeding, which has a history of over 3000 years. The only difference is that this modern technology is more advanced in precisely targeting specific properties allowing for shorter breeding times (Wendel and Entine, 2013). GM advocates have also
weighed in on the safety of crops. Several international science organizations, like the World Health Organization (WHO), the American Association for The Advancement of Science (AAAS), and the National Academy of Science (NAS), claimed that crop biotechnology should be safe, openly promising the safety of GM crops. Those organizations asserted that “GM crops are as safe—and in the case of nutritionally enhanced varieties, such as Golden Rice, healthier—than conventional and organic crops. The consensus over the health and safety is as strong as the consensus that we are undergoing human induced climate change, vaccines are beneficial, and not harmful and evolution is a fact” (Wendel and Entine, 2013). Furthermore, Nicolia and his colleagues analyzed 1,783 studies about GMOs’ environmental and safety impacts published from 2002 to 2012 and found that there is no significant correlation between detected hazards and the use of GM crops (Nicolia et al., 2014).

Communication Influence

Since the 1920s, several studies have explored the general effects of mass communication on the people’s attitudes. (Severin & Tankard, 1988). During a long period, many ideas, like bullet theory, limited effects model, moderated effects model, and powerful effects models, were raised, supported, criticized, or replaced. Some scholars believed media effects are powerful based on the assumption that the audience is passive. Gerbner’s this cultivation theory claims that an individual’s common conception of reality was cultivated by a long-term exposure to television. His study found that,
compared to light television viewers, heavy television viewers were more likely to overestimate the incidence of serious crimes in society and to believe that people in the world could not be trusted (Gerbner, 1969). Funkhouser and Shaw (1990) pointed out that both content and the processes of communicated experiences could be manipulated or rearranged to shape to audience perceptions of reality.

Other scholars believe media effects are limited based on the assumption that the audience is active. Effects of mass communications are limited due to audiences’ active behaviors in selective exposure, selective perception, and selective retention. The uses and gratifications theory (UGT) assumes that an individual can actively select the media or interpersonal channel by evaluating various media channels and content, and accessing function alternatives based on the awareness of one’s social, psychological, and biological needs (Berger, Roloff & Roskos-Ewoldsen, 2010, p. 261). The media or channel an individual chooses is believed to meet one’s need (Nabi & Oliver, 2010).

Hovland (1953) considered persuasion as a mass communication behavior at the micro-level of individual reception of message. Katz (1960) asserted that all attitudes help to structure an understanding of environment. He identified four functions that attitudes perform for the personality. They are the adjustment function of satisfying utilitarian needs, the ego-defensive function of handling internal conflict, the value-expressive function of maintaining self-identity and of enhancing the self-image, and the knowledge function of giving understanding and meaning to the ambiguities of the world.
about us. He pointed out that persuasion can be achieved by matching message content to attitude function.

**Statement of the Problem**

As a controversial technological innovation, genetic modification has largely influenced the food industry all round the world. On one hand, GM seed are rapidly accepted by farmers because of its benefits offered such as high yield and high quality. On the other hand, GM food products seem hardly poised to become the dominant choice of consumers, even though many food scientists and organizations promise that safety, quality and sustainability of those foods. GM foods are assumed to benefit consumers and society through substantially, including foods that offer increased nutritional value, enhanced taste, specific medicinal properties, and greater cleanliness, safety, and economy.

Several current studies have been done to explore factors that might hinder the adoption of GM food products by consumers. Risk perception, subjective feeling of risk severity by observing an object’s characteristics, is the dominant explanation. Klerck and Sweeney (2007) examined the effect of individual’s knowledge on risk perception, the latter of which is also associated with purchasing behavior of GM food products. They showed that consumers’ perceived risks would increase when they are exposed to controversial and biased media reports, while consumers’ subjective evaluation of GMOs would be more favorable when they are exposed to objective and scientific information,
even to those showing risks. However, there is no further research of psychology behind consumer’s rejection. For example, the application of elaboration likelihood model (ELM), which is popularly used in persuasion studies such as organic food promotion, is rarely related to GMO adoption research.

ELM assumes that people with low involvement will engage in a peripheral route of processing and people with high involvement will engage in a central route (Petty & Cacioppo, 1986). However, consumers have more moderate involvement and as a result, it is hard to directly predict their route of engagement. They might be affected by both of these two routes. This study is unique in concentrating on the decision-making process of consumers with moderate involvement. Based on the lack of studies related to understanding the individual’s behavior in processing pro-GMO advertisements, there is a need to explore the interaction between audience’s predisposition toward GM food products and persuasive messages of GM food products during both active and passive message processing. Understanding how customers self-evaluate genetically modified organisms (GMOs) and how they react with pre-GMO persuasive message of different formats would help improve the efficacy of scientific communication

**Purpose of the Study**

The purpose of this study was to explore how customers engage in the pro-GMO advertisement based on their pre-existing knowledge about GMOs under the theoretical framework of the Theory of Planned Behavior and the Elaboration Likelihood Model.
This study hypothesized that an individuals’ pre-existing knowledge about GMOs would act as a key factor to their engagement. It aimed to focus on the interaction between audience’s predisposition toward GM food products and persuasive messages of GM food products during both active and passive message processing. It also explored how an individual forms predispositions toward genetically modified Organisms (GMOs) by self evaluating the safety, quality, and social functions of GMOs.

This study was significant based on the fact that the customer overall acceptance of food with GM ingredients is relatively low, even though sales of genetically modified seeds in some big seed companies like Monsanto were steadily rising. Although various lobbying and public relations strategy were done to promote the adoption of GM food products, customers were still reported to be not willing to purchase GM food products, especially in developed countries (USDA, 2014). Many of past studies focused on how risk perception works in GMOs issues. However there is no researches talking about how costumers interact with GMO promotion materials like pro-GMO advertisements. Studies related to media effects of passive exposure illustrate that when processing the campaign messages, some specific characteristics work as “match-up” factors to influence persuasion effectiveness. Berger et al. (2010) pointed out that audiences might question what they see and develop their own interpretation of a media product based on their life experiences, education, family, and cultural influences. Dijkstra et al. (1998) found that tailoring messages to smokers in different stages, from low to high, could promote smoking cessation more effectively. Meanwhile, Hwang (2010) claimed that smoking
habits that an individual’s smoking status might moderate one’s exposure and perception of anti-smoking messages during a campaign. In other words, audience is active in exposing themselves to persuasion materials. They might select and engage with specific messages to meet their social, psychological, and biological needs (Berger et al., 2010). This study was unique in exploring how customers work as both active and passive audience in the GMO issues.

**Research Objectives**

The Purpose of this study was thus to explore how customers self-evaluate genetically modified organisms (GMOs) and how they react with pro-GMO persuasive messages in different formats.

1. To describe how an individual forms predispositions toward genetically modified Organisms (GMOs) by self evaluating the safety, quality, and social functions of GMOs.
2. To describe how the audience’s predisposition toward GMOs influences the effectiveness of persuasive messages when audiences are exposed to the message.
3. To describe the difference in effectiveness of messages by their formats.

**Limitations**

The study sampled students from the Ohio State University. Many of the demographic variables such as age, education, and experience with GMOs were similar
for all respondents to the survey. Therefore, it was not possible to generalize the findings
to any other social member like households or to target audiences out of the Ohio State.
Because the data was collected by survey, the findings only represent the period during
which the survey was completed.

Definition of Terms

Genetic Engineering (or Genetic Modification): The technique used to alter genetic
material (genes) of living cells. A gene is a segment of DNA that expresses a particular
trait. It is a unit of heredity transmitted from generation to generation during reproduction.
DNA constitutes the genetic material of most known organisms. Genetically engineered
crops were first introduced in 1996 (Newton, 2014, p. 15; USDA, 2014).
Active audience: Audience who actively participates in the communication process based
on their needs and goals. They select the media or interpersonal channel which are
believed to be able to meet their needs (Levy & Windahl, 1985).
Passive audience: Passive audience do not actively engage with a media text. Their
common conceptions of reality were cultivated by a long-term exposure to media.
Matching effect: Derived from the idea of functioned attrition that persuasion can be
achieved by matching message content to attitude function.
Chapter 2 Literature Review

The following chapter analyzes previous studies related to consumers’ psychology behind the rejection or adoption of GM food products. The theoretical framework, including relationship between attitude and behavior change, the components and application of the elaboration likelihood model and the concept of matching effect, were also explained here.

As a controversial technological innovation, genetic modification has largely influenced the food industry all round the world. Such technology is accepted rapidly by farmers because of benefits offered such as high yield and high quality. On the other hand, genetically modified food products seem hardly poised to become the dominant choice of consumers in both developed and developing countries, though many food scientists and organizations promise that further innovations can benefit consumers and society substantially, including foods that offer increased nutritional value, enhanced taste, specific medicinal properties, greater cleanliness, safety, and economy (Edwards, Faerber, Goenawan & Osawa, 2005).
Why do people reject purchasing GM food products? In recent years, several studies have been done to explore factors which might hinder the adoption of GM food products by consumers. Risk perception, subjective feeling of risk severity by observing an object’s characteristics, is the dominant explanation. Klerck and Sweeney (2007) examined the effect of individual’s knowledge on risk perception, the latter of which is also associated with purchasing behavior in GM food products. The researchers showed that consumers’ perceived risks would increase when they are exposed to controversial and biased media reports while consumers’ subjective evaluation on GMO would be more favorable when they are exposed to objective and scientific information, even to those showing risks (Klerck & Sweeney, 2007).
Attitude-Behavior Consistency

In early social psychology studies, attitudes, along with belief and intentions, is regarded with one of the determinants of specific behavior. In other words, early scholars considered that attitude change might affect changes in behavior (Ajzen & Fishbein, 1977). Allport (1935) defined attitude as the mental and neural state of readiness, organized through experience exerting a directive or dynamic influence upon the individual’s response to all objects and situations with which it is related. From the perceptive of social psychology, an individual’s attitude toward an objective might establish a predisposition that will latter work as a part of his response to the object showing a favorable or unfavorable manner. After a long-time debate on whether there is certain consistency between the symbolic attitudes (responses to the letter) and actual behavior, Ajzen and Fishbein (1977) proposed that attitude was part of a system of constructs influencing behavior. They developed the theory of planned behavior (TPB) which assumes behavioral intention is consistent with behavior. According to TPB, behavioral intention is influenced by a person’s attitude toward performing a behavior, by subjective norms (beliefs about how individuals who are important to the person consider his or her behavior), and by perceived behavioral control (beliefs about whether individuals can control the particular behavior).

Aertsens et al. (2009) adapted the TPB (The theory of planned behavior) model by adding the concept of values theory to discussing personal determinants of organic food
consumption. This adapted TPB model introduces three constructs (attitude toward the behavior, subjective norm, and perceived behavioral control) that will influence an individual’s behavioral intention during the process of behavior change. They argued that Schwartz’s 10 motivational values, security, self-direction, and hedonism related to human behavior, can act on the three constructs of TPB model. After combing the TPB model and Schwartz’s value theory, they predict that 10 values may serve as 10 specific but stable motivators for consuming organic food by interfering with consumers’ initial beliefs, attitudes, and personal norms (Aertsens, Verbeke, Mondelarers, & Huylenbroeck, 2009; Schwartz, 1992; Schwartz, 2006). In addition, cognition and emotion are also supposed to influence the formation of attitude, and both social activities and an individual’s perception on behavior barriers will influence the formation of subjective norm and perceived behavior control, all of which will later influence behavioral intentions. Robinson and Smith (2002) believed that compared to demographic factors like educational background and income, psychosocial variables like attitudes, belief, and subjective norms have higher positive correlation with purchase intention for sustainable foods.

The Elaboration Likelihood Model of Persuasion

Although the TPB model has strong explanatory power in predicting intention and behavior change, it is unable to indicate how people interact with exposure to persuasive message (Hagger & Chatzisarantis, 2005). Instead, the Elaboration Likelihood Model
(ELM) is widely used to predict attitude and behavior by providing a conceptual framework for mapping out key factors in affecting consumers’ behavior. Petty and Cacioppo’s ELM model of persuasion outlines a synthetic framework for thinking about the attitude change processes. It assumes that people with different degrees of involvement will engage in two different routes to persuasion. One is the central route, i.e., careful and thoughtful processing, and the other is the peripheral route, i.e., less careful and less thoughtful processing.

The central route is more likely to occur when people have high motivation to continue to think about the message they are exposed to, and meanwhile have the ability to think about merits presented in the message. Motivation here means a feeling of personal relevance and ability means whether an individual can judge exposed messaged as logical or rational (Petty & Cacioppo, 1986). As a result, attitude changes that result mostly from processing through a central route will show greater temporal persistence, greater prediction of behavior, and greater resistance to counterpersuasion.

On the other hand, if an individual lacks either motivation or ability, attitude change will be more likely to occur via a peripheral route. In other words, an individual might change his or her attitude simply depending on peripheral cues, which is unnecessary stimuli in the persuasive content like source credibility. As a result, attitude changes will be more vulnerable when exposed to counterpersuasion and have lower prediction of behavior. The two routes to persuasion described by ELM are depicted schematically in Figure 2-1.
Figure 2-1. The Elaboration Likelihood Model

Schematic Depiction of Two Routes to Persuasion. This diagram depicts the possible endpoints after exposure to a persuasion communication according to the Elaboration likelihood Model (i.e., central attitude change, peripheral shift, no change) (Adapted from Petty & Cacioppo, 1986, p. 4)

The ELM postulates that “variables, such as source credibility and need for cognition, can affect the amount and direction of attitude change by serving as persuasive arguments, serving as peripheral cues and/or affecting the extent or direction of issue and argument elaboration” (Petty and Cacioppo, 1986, p.16). The ELM explains variables as
persuasive arguments, peripheral cues or affecting the extent or direction of argument elaboration. In other words, by varying the argument quality in a persuasive message, or adding some simple cues, which may trigger relative primitive affective states related to the attitude object may invoke guiding inference and an individual’s attitude will be influenced. Meanwhile, ELM also postulates that “Although people want to hold correct attitudes, the amount and nature of issue-relevant elaboration in which they are will or able to engage to evaluate a message vary with individual and situational factors” (Petty and Cacioppo, 1986, p.16).

The Application of Elaboration Likelihood Model

Frewer and his colleagues identified different factors related to influencing strategy efficiency for risk communication, which is measured by individual’s perception of risk, under the framework of elaboration likelihood model. They examined how the source credibility, persuasive content, and personal risk relevance influence people with different involvement, whether high or low, on perceived risk when exposed to consumption related risks like food poisoning. It is thought that the persuasion processing route would be influenced by some other situational factors like hazard types, persuasive content, and source credibility while influencing risk perception (Frewer, Howard, Hedderley, & Shepherd, 1997). In their study, two common consumption related hazards, microbiological food poisoning (highly related hazard) and excessive alcohol use (low related hazard), were used to investigate associations between individual’s
engagement in persuasion route and situational factors. The result showed that although source credibility will affect the degree the recipient response is favorable, it does not make much contribution to the message-processing route. However, it also shows that either optimistic bias hidden in the persuasive content or low relevance of hazard to the public, like excessive alcohol, negatively affects risk reception (Frewer, Howard, Hedderley, & Shepherd, 1997).

**Food Consumption Concern**

The adoption of genetically engineered (GE) crops in farming practice has grown substantially over recent years, while the successful GE crops market still has a long way from being reached. Human food choice is determined by a complex set of interrelated factors, including sensory factors like flavor and texture, and non-food concerns like price and social factors. Research related to consumer concern over genetically modified food products is sparse. Based on the other research about consumer reasons for purchasing organic foods or sustainable foods, food quality and safety and social responsibility are three main motives.

Due to the public increasing realization in the food processing industry and increasing demanding in food choice, the current food market is highly competitive. Adding value is one of the most popular strategies for both new and old competitors to survive in the competition. Adding value is customer-oriented process in which value are added to food product until the target consumers perceive such product as having more
quality (Grunert, 2005). As one of the competitive parameters of food products, food quality can be categorized into objective quality and subjective quality. The former refers to the characteristics of the product developed by food technologists, while the latter refers to the characteristics perceived by consumers (Grunert, 2005). Only when the product has both products will it become competitive. In other words, the competitive quality of food products means such product has the characteristics that are demanded and perceived by consumers. In consumer research, the quality we often use is the subjective quality (Gruner, 2005).

Food quality involves sensory aspects, convenience, specific process and health aspects, and some other parameters. Among them, health concerns has been proven the primary parameter by a majority of studies (Hughner et al., 2007; Michaelidou & Hassan, 2008). Several studies found that consumers with health consciousness who pay more attention to their well-being states would be more likely to engage in health behavior. They are motivated to have concern about nutrition information and physical fitness (Kraft & Goodell, 1993). Lockie et al. (2002) pointed out that perceived health was a strong motive for high income earners to buy organic food, though the logic behind such perception is that the higher price of organic food leads to the healthier product. The attendees of his focus groups claimed that the health and natural content of food was much more important than fitness and weight control. Magnusson and her colleagues (2003) showed that an individual’s favorable attitude toward organic food and positive purchase intention is positively correlated with one’s concern about own or family health.
Furthermore, health concern was also positively correlated with purchase frequency (Magnusson et al., 2003).

Although food safety can be regarded as a part of food quality because it is also a desirable property demanded by consumers, it influences consumer decisions differently from other food quality factors (Brunso et al., 2002). Brunso and her colleagues claimed that consumers could distinguish food safety from food quality automatically in their minds, and under some circumstances, safety perception plays the most predominant role in food choice (Brunso et al., 2002). For example, a consumer might avoid the categories or brands when the food safety problems arise, like BSE (Bovine spongiform encephalopathy). Consumers also might reject the food products processed by specific processes, technologies like food irradiation (Grunert, 2005). Food safety refers to the exception of hazards including physical, chemical, and biological hazards. Simply, it means the residuals in the food like dust, chemical spray, fertilizers, and bacteria. Several studies illustrate that food safety is a strong predictor of food purchase intention. Lockie et al. (2002) found that as with food quality, food safety is another driver of the growth in the organic food market. Padel and Foster (2005) pointed out that the main reason for consumers to purchase organic food is to avoid food allergies and to reduce chemical residue exposure. People with certain illnesses, like cancer, are more likely to purchase organic foods.

Different from concerns about health and safety, concerns about social responsibility, like environmental concern and animal welfare concern, are more altruistic.
Consumers might pay more attention to benefits certain food products bring to the society, rather than to the individual or one’s family. A positive correlation between ethical self-identity and food choice has been found in many studies. Vermeir and Verbeke (2006) believe social responsibility is another key factor in human everyday consumption practices. They defined ethical consumers as those who could perceive the direct link between consumed items and social issues. Such consumerism involves environmental issues, animal welfares, human rights, and labor working conditions in the third world. Ethical consumers might link their purchase behavior with social issue consideration. But those consumers tend to be characterized as middle aged, with about an average educated, higher incomes, with a prestigious occupation, and well-informed. Grankvist and Biel (2001) found also found that the eco-label might lead to a higher purchase frequency. Magnusson et al (2003) claimed that environmentally friendly behavior (EFBs) could predict the favorable attitude toward organic food and purchase intention as strongly as health concerns did. And it is positively correlated with purchase frequency. Michaelidou and Hassan (2007) pointed out a positive correlation between ethical self-identity and favorable attitude toward and purchase intention of organic foods.

The Effects of Matching on Persuasion

Regarding to market choice, food purchases, to some extent, area type of low-involvement behavior that requires only limited decision-making, and risk perceptions have no explanatory power, unless they exceed a certain threshold (Dowling & Staelin,
Some scholars also considered it as moderate-involvement behavior and have examined matching effect.

Although matching effects have been studied in different fields, and been mentioned in different terms, and even been expressed in different ways, all of these studies share one common agreement: that is “persuasion can be achieved by matching message content to attitude function.” (Dillard, 2010, p.205). This is also the idea of attitude functions. Functional theory of attitudes proposes that people are motivated to form their opinions because they derive some kind of psychological benefit from holding and expressing them. Behaviors are more likely to change when persuasive messages directly address the functional content underlying the attitude than when they are addressed to an irrelevant or less relevant function quote (Dillard, 2010). Katz (1960) asserts that all attitudes help to structure an understanding of the environment and identifies four functions, which attitudes perform for the personality. They are the adjustive function of satisfying utilitarian needs, the ego-defensive function of handling internal conflict, the value-expressive function of maintaining self-identity and of enhancing the self-image, and the knowledge function of giving understanding and meaning to the ambiguities of the world about us (Table 2-1). Katz (1960) argues that people hold attitudes for specific reasons, and attitude change will not happen when arguments fail to be located in those ranges.
Adjustive function To maximize the rewards and minimize the penalties in the external environment.

Ego-defensive function To protect himself from the discrepancy between one’s basic understanding and the truth of his external world.

Value-expressive function To reflect his personal value and concept of himself. It clarifies, as well as molds, the self-image.

knowledge function To seek knowledge to understand the world.

| Table 2-1: Four functions which a attitudes perform for the individual (Adapted from Katz, 1960). |

Based on the postulation of Petty and Cacioppo’s elaboration likelihood model mentioned before, message matching, as a communication variable, can increase the effectiveness of communication in changing attitudes by matching communication to various needs, interests, and concerns of a recipient or a group like specific ethnic identity and to general individual differences. Brinol and Petty (2006) suggest that matching a message to recipient characteristics can influence attitudes by serving as a peripheral cue when elaboration is low, by biasing thinking when elaboration is high, and by enhancing the amount of information processing when elaboration is moderate. If ignoring the restriction of other variables like the degree of elaboration, several studies found matching effect could influence communication effectiveness by increasing the amount of thinking. Kreuter et al. (1999) suggested that tailoring print materials would
lead recipients to generating more message-relevant thoughts. Skinner (1994) claimed that tailored messages might make it easier to read and recall by observing that printed physicians’ recommendations for mammography would be more effective when they were tailored to individual woman’s specific perceptions about mammography and breast cancer like risk factors and mammography screen status.

The Application of Matching Effect

Currently, matching effect has been studied in the field of both applied communication and classical mass communication. The former focuses on how specific characteristics work as “match-up” factors to influence persuasion effectiveness. For example, in the field of agricultural communication, Walters and Long (2012) examined different decision making processes related to people with different knowledge backgrounds and “matching effect.” They argue that consumers’ quality perception and purchase intentions are positively associated with their science backgrounds. By comparing different quality rating and purchase intentions scaled by female experts in nutrition and novices, Walters and Long find that the consistence and presence of intrinsic cues (food related labels like ingredient list) and extrinsic cues (health or nutrition claim) will lead to their different performance. The result of their experiment shows that when exposed to the inconsistence of intrinsic and extrinsic cues, experts will perceive a lower quality rate and purchasing intention. Similarly, the consistence of these two cues will lead to higher scaling. Meanwhile, the presence of intrinsic cue without
extrinsic cues will be much easier to decrease the experts’ possibilities of purchasing. In
the field of advertising, Till and Busler (2013) examined how physical attractiveness and
expertise, as match-up factors, influence individual’s brand attitude, purchase intent, and
brand beliefs. They found that a more favorable brand attitude and higher purchase intent
would be formed when using an attractive endorser with a product. They also found that
the use of a celebrity endorser with a product that is consistent with the endorser’s
expertise is related positively to brand attitude and purchase intention. In the field of
health communication, Brug et al. (1998) found that computer-generated personalized
feedback would significantly increase human’s behavioral intention to reduce fat intake
and to increase vegetable intake. Dijkstra et al. (1998) found that tailoring messages to
smokers in different stages, from low to high, could promote smoking cessation more
effectively.

However, the studies of matching effect in classical communication are much deeper
and more detailed. They are not limited to the phenomenon or strategies description.
Instead, they focus more on how messaging matching as a communication variable
influence the effectiveness of communication. They claim that communication can be
matched in different ways such as matching cultural difference and personal difference to
increase effectiveness of health communication. For example, Herek et al. (1998)
observed that for African American adults from the greater Sacramento-Davis area,
videos with a black communicator and culturally specific message were regarded as more
credible, more attractive, and of higher quality. As a result, those messages that match
individual’s specific ethnic identity were more effective to elicit change in long-term AIDS related attitude, belief, and behaviors. They suggested that cultural sensitivity would be better achieved through a culturally specific video than a multicultural video. In addition, many psychology scholars are also investigating the psychological mechanism underlying message matching (Herek et al., 1998).
Summary

Starting from the idea that attitude might work as a predictor of behavior, the Theory of Planned Behavior assumes that behavior is influenced by behavioral intention, while behavioral intention is influenced by a person’s attitude toward performing a behavior (by subjective norms), and by perceived behavioral control. Considering attitude change as a micro-level process of an individual it is affected by both emotional and cognitive factors.

ELM assumes that an individual with a low involvement will engage in a peripheral route of processing and the one with a high involvement will engage in a central route. However, in practice, consumers are more likely to follow a moderate involvement, and as a result, it is hard to directly predict their route of engagement. They may be affected by both of these two routes. This study is focusing on the decision-making process of consumers with moderate involvement to understand an individual’s behavior in processing Pro-GMO advertisements. The study hypothesized that individuals’ pre-existing knowledge about GMOs would act as a key factor to their engagement. It aimed to focus on the interaction between audience’s predisposition toward GM food products and persuasive messages of GM food products during both active and passive message processing. The variables influencing an individual’s predisposition toward edible products are one’s evaluation about the safety, quality, and
social effect. In order to understand how predisposition is formed, the impact these three variables on the evaluation were measured.
Chapter 3  Method

Much of the research discussed in the literature review was about the elaboration likelihood model and matching effect applied in the different fields such as health campaigns and marketing. This study explored how these theories are applied in GMO adoption. It described and explained how consumers’ pre-existing knowledge about GMOs interferes with the interaction between them and persuasive messages of genetically modified (GM) food products during both active and passive message processing. Due to the lack of studies focusing on persuasive message processing behavior of a target audience with moderate involvement (i.e., potential customers), there was a need to acknowledge how potential customers evaluated the niche market of GM food products.

This study was guided by the following research objectives:

1. To describe how an individual forms predispositions toward genetically modified Organisms (GMOs) by self-evaluating the safety, quality, and social functions of GMOs.
2. To describe how the audience’s predisposition toward GMOs influences the effectiveness of persuasive messages when audiences are exposed to the message.

3. To describe the difference in effectiveness of messages by their formats.
Research Design

The basic quantitative research design for this study included a descriptive survey of a random sample of students who attend The Ohio State University.

Subject Selection

The researcher used the 2016 Spring courses list of the Ohio State University (OSU), provided by the OSU student center system, to develop the sampling frame. Courses are coded based on subject (e.g. engineering, science and art), and course career (e.g. undergraduate, graduate and medicine). Students were selected as an appropriate group for research because young adults are the future. Young adults, as future consumers and audience, and their responses are important to the future communication work. They have the potential to influence future food markets and policies (Mitchell, 2012).

There were 58,663 students enrolled in the fall semester of 2015 at the Ohio State University. A sample size of 352 names was drawn randomly to achieve a sample margin of error of less than .05. The researcher randomly chose courses from OSU’s courses list of 2016 spring based on the career level (i.e. undergraduate or graduate) and course classification (i.e., sciences like mathematics and physics, arts like art education and speech, engineering like electronic engineering, and etc.). Table 3-1 represents the courses chosen in this study.
<table>
<thead>
<tr>
<th>Career Level</th>
<th>Course code</th>
<th>Course name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergraduate</td>
<td>ACCTMIS 2000</td>
<td>Foundations of Accounting</td>
</tr>
<tr>
<td></td>
<td>ARTEDUC 1600</td>
<td>Art and music since 1945</td>
</tr>
<tr>
<td></td>
<td>SOCIOL 1101</td>
<td>Introductory Sociology</td>
</tr>
<tr>
<td></td>
<td>AGRCOMM 2367</td>
<td>Agricultural issues in contemporary society</td>
</tr>
<tr>
<td></td>
<td>AGRCOMM 3130</td>
<td>Public Speaking</td>
</tr>
<tr>
<td></td>
<td>FDSCTE 2200</td>
<td>The science of Food</td>
</tr>
<tr>
<td></td>
<td>BIOLOGY 3401</td>
<td>Integrated biology</td>
</tr>
<tr>
<td></td>
<td>CMLDR 2530</td>
<td>Introduction to ACEL</td>
</tr>
<tr>
<td></td>
<td>CHEM 2310</td>
<td>Introductory Organic chemistry</td>
</tr>
<tr>
<td></td>
<td>MECHENG 2010</td>
<td>Statics</td>
</tr>
<tr>
<td>Graduate</td>
<td>PHYSICS 7602</td>
<td>Classical and statistical physics 2</td>
</tr>
<tr>
<td></td>
<td>LAW 6112</td>
<td>Property</td>
</tr>
<tr>
<td></td>
<td>ENVSCI 7899</td>
<td>Current issues in environment science</td>
</tr>
<tr>
<td></td>
<td>ACCTMIS 7200</td>
<td>Corporate financial reporting 1</td>
</tr>
<tr>
<td></td>
<td>ANIMSCI 5530</td>
<td>Comparative Animal nutrient metabolism</td>
</tr>
<tr>
<td></td>
<td>CSE 6341</td>
<td>Foundation of programming language</td>
</tr>
<tr>
<td></td>
<td>STAT 5301</td>
<td>Intermediate data analysis</td>
</tr>
</tbody>
</table>

Table 3-1: Subject Selection

The e-mail for the request of survey distribution then was sent to the instructors of these courses. After getting the permission from instructors for a willingness to forward the email of survey request on the researcher’s behalf, the e-mail with the study description and survey link was sent to the instructors and then was forwarded to the
students. The reminder e-mail attached with survey was send to the instructors and students one week after sending the first one (See Appendix A).

Instrumentation

A Qualtrics online survey software was used in this study to collect data (See Appendix B).

The validity of the survey was reached through a thorough review of the literature and through a panel of experts review. Meanwhile, in order to estimate the reliability of this research, the survey was piloted tested by undergraduate and graduate students in the Department of Agricultural Communication, Education, and Leadership at the Ohio State University before launching the survey to the target potential. Data collected from this pilot test was analyzed using SPSS. To evaluate the internal consistency of the scale items in the survey, Cronbach’s alpha was applied on Likert-type attitudinal scales and bipolar adjective scales. The institutional review board (IRB) approved the research proposal before conducting the pilot study (See Appendix C).

Measures

This study was designed for audiences who are under both active exposure and passive exposure (as showed in Figure 3-1). Individuals have two ways, active and passive, to be exposed to messages. When actively engaged in to persuasive messages, selectivity process mainly describes how an individual’s pre-existing attitudes bias his or
her thinking about persuasive message, supporting attitudinally congruent information. Selectivity process includes selective exposure and selective perception. The former is an individual’s tendency to expose oneself to an attitudinally congruent message than incongruent message and the latter is an individual’s tendency to perceive attitudinally congruent messages more positively. Different from a within-group research design (i.e., showing two types of message to a single audience), between-group design is used in this study by using one-directional messages (e.g., pro-GMO messages) to compare responses of people who have favorable (pro-GMO) and unfavorable (anti-GMO) attitudes to the message.

For selective exposure, individuals are supposed to be more likely to be exposed to messages that assimilate with their disposition. Consequently, anti-GMO individuals are predicted to be less likely to report exposures to pro-GMO messages than pro-GMO individuals. This study tests whether a person’s knowledge background (pre-existing knowledge about GMOs) is associated with his/her preference to GMO-related headline exposure.

In selective perception, individuals are supposed to be more likely to disparage messages that are incongruent with their pre-existing attitudes toward an object. As a result, anti-GMO individuals are supposed to be more likely to engage in defensive processing of pro-GMO messages than pro-GMO individuals.

In passive exposure, this study tests how matching effects between individuals’ background and message content influence the effectiveness of persuasion. The pro-
GMO advertisement exposed to the audience in this study consisted of a negative GMO-related image, and 175-word pro-GMO text and logos of academic organizations whom are pro-GMO. The image used in this advertisement was a popular image greatly related to GMOs, which depicted a red apple being injected by three syringes (See Appendix D). This image was quite natural but is perceived anti-GMO because the syringes might lead a viewer to think about harm to food leading to the fear appeal effect on audiences. The text was adapted from a popular blog article written by Wendel and Entine on October 8, 2013 and named “With 2000+ global studies affirming safety, GM foods among most analyzed subjects in science”. It claimed that there were nearly 2,000 published peer-reviewed reports promising the safety of GM food products. Meanwhile, Several worldwide organizations like the WHO (World Health Organization) and AAAS (American Association for the Advanced Science) claimed that GM food products should be safe. Logos of some of these organizations were included in the advertisement to increase the source credibility of this advertisement. The representatives were ACSH (American Council on Science and Health), WHO (World Health Organization), AAAS (American Association for the Advanced Science), ADA (American Dietetic Association), SOT (Society of Toxicology), and AMA (American Medical Association).
Variables

The formation of the predisposition was measured by participants’ evaluation of their own overall attitudes toward GMOs, pro- or anti, and their scaling of some statements related to some characteristics of GMOs. Each of those statements includes one characteristic of GMOs, which can be classified into one of three variables. They are safety, quality, and social responsibility. These variables are involved in more than 2,000 published papers related to GMOs in the past 15 years (A decade of EU-funded GMO research, 2010). In order to understand how predisposition is formed, the impact these three variables have on the evaluation were measured. Table 3-1 presents an example of related questions.
What do you think about GMOs? (1-strongly disagree; 5-strongly agree)

<table>
<thead>
<tr>
<th>Question</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genetic modification can actually improve the nutritional content of some foods, for example low linoleic acid canola oil that can reduce trans-fat content</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>GMOs have some potential damage to our health. For example it is much easier to cause allergies</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>GMOs can solve the global hunger problem due to its high-yielding</td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>

Table 3-2: Example of a Predisposition Formation Scale Item

Before answering the questions related to passive exposure, participants were exposed to a pro-GMO advertisement, which claims that GMOs are proved to be safe by thousands of scientists but shows an anti-GMO picture. Their extent of attitude change was then measured by how they perceived this message. More specially, they were asked to evaluate the message they just read by using an attitudinal scale using terms including logical, educational, informative, factual, useful, attractive, desirable, stimulating, and informative (As showed in table 3-2).
The advertisement which I just read is:

<table>
<thead>
<tr>
<th>Not logical</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>Logical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not educational</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>Educational</td>
</tr>
<tr>
<td>Not informative</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>Informative</td>
</tr>
<tr>
<td>Not factual</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>Factual</td>
</tr>
<tr>
<td>Not useful</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>Useful</td>
</tr>
</tbody>
</table>

Table 3-3: Example of an Attitude Scale Item

Selective exposure was measured by participants’ preference among some certain message topics. More specially, after learning their basic demographic information and pre-existing attitudes toward GMOs, respondents were exposed to some topics. Some of them were clearly pro-GMO, some of them were clearly anti-GMO and some of them were neutral. Respondents then chose a statement that was most attractive to them. Table 3-3 illustrates the examples of statements for selective exposure. Headlines used in this section were selected from a Google.com search, for keywords like GMO or PRO-GMO or ANTI-GMO.
If you are search for the information of GMO on the Internet, which title following is most attractive to you?

| Why Are We Pro-GMO? |
| 2000+ Reasons Why GMOs Are Safe To Eat And Environmentally Sustainable |
| GMO: Seed of Death |

Table 3-4: Example of statements for Selective Exposure

| Meanwhile, selective perception was measured by participants’ extent of disparagement of each statement related to GMOs. Respondents reported the extent to which they think of each statement was convincing, ranging from the most convincing to the least (As presented in table 3-4). |

| The extent to which you agree that each of following statement is convincing? (1- strongly disagree; 5- strongly agree) |
| GM food products have higher nutrition | 1 | 2 | 3 | 4 | 5 |
| On balance, the benefits of genetically modified foods outweigh the harms. | 1 | 2 | 3 | 4 | 5 |

Table 3-5: Examples of Selective Perception Scale Items

| The effectiveness of message styles (i.e., image and text) was also examined by measuring participants’ responses to the advertisement. Tale 3-5 shows the example of survey questions related to participants’ responses. |
Which component of the advertisement did you agree with?
The Photo    The Text    Everything

Which component of the advertisement caught your attention first?
The Photo    The Text    Everything

Do you feel that this advertisement change your opinion?
Yes    No

Did you read the text on the advertisement?
Yes    No

| Table 3-6: Example of Questions Related to Response |
Reliability

Cronbach’s Alpha was used to measure the internal consistency of the final survey distributed to the sample population of the Ohio State University. As shown in Table 3-7, the six statements measuring predisposition toward GM food products combined had an alpha of .750.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Mean</th>
<th>SD</th>
<th>Corrected Item-Total Correlation</th>
<th>Cronbach's Alpha if Item Deleted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genetic modification can actually improve the nutritional content of some food, for example low linoleic acid canola oil can reduce trans fat content.</td>
<td>3.77</td>
<td>1.09</td>
<td>.614</td>
<td>.680</td>
</tr>
<tr>
<td>GMOs have the potential to provide edible plant vaccines that could be used to immunize individuals against a wide variety of infectious diseases</td>
<td>3.36</td>
<td>0.96</td>
<td>.280</td>
<td>.763</td>
</tr>
<tr>
<td>Genetically modified crops can solve the global hunger problem due to its high yield</td>
<td>3.74</td>
<td>1.09</td>
<td>.361</td>
<td>.748</td>
</tr>
<tr>
<td>Predisposition-GMOs are environment-friendly</td>
<td>2.92</td>
<td>1.13</td>
<td>.631</td>
<td>.673</td>
</tr>
<tr>
<td>GMO cannot be safe because they are not natural</td>
<td>2.62</td>
<td>1.25</td>
<td>.613</td>
<td>.676</td>
</tr>
</tbody>
</table>

Table 3-7: Cronbach's Alpha Reliability Coefficients for Predisposition Formation Scale
Table 3-7: Continued

GMOs have some potential damage to our health. For example, it can cause allergies

<table>
<thead>
<tr>
<th>Statement</th>
<th>Mean</th>
<th>SD</th>
<th>Corrected Item-Total Correlation</th>
<th>Cronbach's Alpha if Item Deleted</th>
</tr>
</thead>
<tbody>
<tr>
<td>GM food products have higher nutrition</td>
<td>3.00</td>
<td>1.06</td>
<td>.563</td>
<td>.290</td>
</tr>
<tr>
<td>GM food products have favorable flavor</td>
<td>3.73</td>
<td>1.04</td>
<td>-.007</td>
<td>.736</td>
</tr>
<tr>
<td>GM food products can create an essential sustainable way to feed the world</td>
<td>3.79</td>
<td>1.05</td>
<td>.419</td>
<td>.423</td>
</tr>
<tr>
<td>On balance, the benefits of genetically modified foods outweigh the harms</td>
<td>3.36</td>
<td>1.08</td>
<td>.479</td>
<td>.366</td>
</tr>
</tbody>
</table>

Predisposition Formation Scale Alpha = .750

For the four statements in the audience’s selective perception, an Alpha of .559 was originally calculated (See Table 3-8). Due to the low alpha for “GM food products have favorable flavor”, this item was deleted from the scale for a final alpha of .736.

Table 3-8: Cronbach's Alpha Reliability Coefficients for Selective Perception Scale
Table 3-9 illustrates an alpha of .813 for 10 items in the evaluation scale to the advertisement.

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>Corrected Item-Total Correlation</th>
<th>Cronbach's Alpha if Item Deleted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logical</td>
<td>5.18</td>
<td>1.51</td>
<td>.607</td>
<td>.784</td>
</tr>
<tr>
<td>Education</td>
<td>4.94</td>
<td>1.58</td>
<td>.635</td>
<td>.781</td>
</tr>
<tr>
<td>Informative</td>
<td>5.06</td>
<td>1.50</td>
<td>.611</td>
<td>.784</td>
</tr>
<tr>
<td>Factual</td>
<td>4.39</td>
<td>1.46</td>
<td>.688</td>
<td>.777</td>
</tr>
<tr>
<td>Useful</td>
<td>4.88</td>
<td>1.41</td>
<td>.602</td>
<td>.786</td>
</tr>
<tr>
<td>Attractive</td>
<td>3.88</td>
<td>1.80</td>
<td>.199</td>
<td>.830</td>
</tr>
<tr>
<td>Desirable</td>
<td>4.27</td>
<td>1.64</td>
<td>.381</td>
<td>.808</td>
</tr>
<tr>
<td>Stimulating</td>
<td>4.36</td>
<td>1.64</td>
<td>.747</td>
<td>.767</td>
</tr>
<tr>
<td>Informational</td>
<td>4.48</td>
<td>1.73</td>
<td>.221</td>
<td>.826</td>
</tr>
<tr>
<td>Pro-GMOs</td>
<td>4.79</td>
<td>1.87</td>
<td>.399</td>
<td>.808</td>
</tr>
</tbody>
</table>

Evaluation Scale Alpha= .813

Table 3-9: Cronbach's Alpha Reliability Coefficients for Evaluation Scale

Data Analysis

IBM SPSS Statistics, a software package used for statistical analysis, was used to analyze all data from the survey. For the first objective to understand the respondent’s predisposition and its formation, the researcher analyzed three independent variables and the one dependent variable of predisposition. Measurement of independent variables for predisposition towards GM food products required the recoding of negatively worded
endpoints on positive side of the scale. It made that positive attitudes would be reflected by higher numbers. Meanwhile, the measurement of each of three independent variables was calculated as the average mean of two belonging statements scaling. After recoding, a regression analysis was applied to get a least squares prediction equation to see how importantly each independent variables work on the dependent variable. The dependent variable was measured by a 7-point bipolar scale for the self-evaluation of overall attitude towards GMOs, from pro- to anti-GMO.

Selective exposure and selective perception were measured for objective two to understand respondent’s active behavior in GMO issues. A frequency calculation was applied to understand the preference to the GMO-related headlines among respondents. Meanwhile, selective perception was measured by participant’s extent of disparagement of each statement related to GMOs. A 5-point Likert-Type Scale ranging from strongly agree to strongly disagree was used. The researcher then calculated the mean for each statement and the Pearson’s correlation between the direction measure of statement agreement and the self-evaluated overall attitude.

The matching effect during passive exposure was also measured for objective two to see the respondent’s engagement to a pro-GMO advertisement. A 7-point attitudinal scale, whose negative endpoints were recorded on the positive sides of the scale, measured the evaluation of a pro-GMO advertisement. After recoding, the higher numbers reflect a positive evaluation. The researcher calculated the mean of the 10 items and the Pearson correlation between the means and the self-evaluated overall attitude.
In terms of objective three, to understand the persuasive effectiveness of different advertisement components, some questions related to the recall of the advertisement were asked. The researcher calculated the frequency of each question.

In addition, Crosstabs were also reported to show the popularity of different communication channels and their effects on GMO-related attitude formation. Communication channels included mass media like newspapers and television, internet, discussion among peers, perceived public opinion, and class and science-related programs. The researcher also provided a descriptive table to show the demographic characteristics of respondents, including age, gender, current academic status, eating habits and food purchasing habits.

Summary

This chapter described the research design and explained the construction of each component of the survey in the study. The researcher also represented the process of subject selection, date collection, and instrument administration. The last section of this section showed how the data collected by the survey was analyzed.
Chapter 4 Results

The purpose of this study was to explore how consumers engage in a pro-GMO advertisement based on their pre-existing knowledge about GMOs under the theoretical framework of the Theory of Planned Behavior and the Elaboration Likelihood Model. This study hypothesized that an individuals’ pre-existing knowledge about GMOs would act as a key factor to their engagement. It aimed to focus on the interaction between an audience’s predisposition toward GM food products and persuasive messages of GM food products during both active and passive message processing. It also explored how an individual forms predispositions toward GMOs by self evaluating the safety, quality, and social functions of GMOs.

Of 48 respondents, 43 (89.6%) completed the survey, and 5 (10.4%) did not complete the survey. As showed in Table 4-1, the respondents were unevenly distributed by both age and gender. The majority (70.8%, n=34) were aged between 18 and 25 years old, and 16.7% (n=8) were older than 26 but younger than 45. Also, 52.1% (n=25) of respondents were women while 37.5% (n=18) were men. Most respondents (52.1%, n=25)
were enrolled in an undergraduate program, while 37.5% (n=18) were a graduate program, half of which were in a master’s program.

In terms of eating habits, most of the respondents, roughly 88.4% (n=38), responded they eat meat, while 4.7% (n=2) reported to be gluten free. 7.0% (n=3) regarded themselves as omnivorous (i.e. they eat everything), and none of them were reported as vegetarian or vegan.

In terms of food purchasing habits, the majority, 62.8% (n=27) shopped for food at least once a week, followed by 11.6% (n=5) purchased food once every two weeks, and 2.09% (n=9) purchased food at the most three times a month. Of respondents, 4.7% (n=2) went shopping for food less than once a month. When selecting food products, 32 (66.7%) respondents reported to care more for the nutrition or health claim, 33 (68.8%) respondents were reported to think more about price issues. Only 6 (12.5%) were reported to look for a non-GMO labeling. Others also consider some different characteristics like allergy warnings or country of origin. Of the respondents, 6 (12.5%) were reported to consider nothing except for the sell-by date.
Table 4-1: Demographic Characteristics of Participants

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-25</td>
<td>35</td>
<td>81.0</td>
</tr>
<tr>
<td>26-35</td>
<td>5</td>
<td>11.9</td>
</tr>
<tr>
<td>36-45</td>
<td>3</td>
<td>7.1</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>18</td>
<td>41.9</td>
</tr>
<tr>
<td>Female</td>
<td>25</td>
<td>58.1</td>
</tr>
<tr>
<td><strong>Current Level of Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undergraduate</td>
<td>25</td>
<td>58.1</td>
</tr>
<tr>
<td>Master</td>
<td>13</td>
<td>30.2</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>5</td>
<td>11.6</td>
</tr>
<tr>
<td><strong>Eating Habit</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gluten Free</td>
<td>2</td>
<td>4.7</td>
</tr>
<tr>
<td>Meat eater</td>
<td>38</td>
<td>88.4</td>
</tr>
<tr>
<td>Others (Omnivorous)</td>
<td>3</td>
<td>7.0</td>
</tr>
<tr>
<td><strong>Frequency of Purchasing Food</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More than once a week</td>
<td>10</td>
<td>23.3</td>
</tr>
<tr>
<td>Once a week</td>
<td>17</td>
<td>39.5</td>
</tr>
<tr>
<td>Once every two week</td>
<td>5</td>
<td>11.6</td>
</tr>
<tr>
<td>Three times a month</td>
<td>4</td>
<td>9.3</td>
</tr>
<tr>
<td>Twice a month</td>
<td>4</td>
<td>9.3</td>
</tr>
<tr>
<td>Once a month</td>
<td>1</td>
<td>2.3</td>
</tr>
<tr>
<td>Less than once a month</td>
<td>2</td>
<td>4.7</td>
</tr>
</tbody>
</table>

Continued
Table 4-1: Continued

<table>
<thead>
<tr>
<th>Food Claims taken into consideration (At most three options)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutrition/health claim</td>
<td>32</td>
<td>66.7</td>
</tr>
<tr>
<td>Non-GM labeling</td>
<td>6</td>
<td>12.5</td>
</tr>
<tr>
<td>Allergy alarm</td>
<td>6</td>
<td>12.5</td>
</tr>
<tr>
<td>Country of origin</td>
<td>3</td>
<td>6.3</td>
</tr>
<tr>
<td>Price</td>
<td>33</td>
<td>68.8</td>
</tr>
<tr>
<td>None except sell-by date</td>
<td>6</td>
<td>12.5</td>
</tr>
</tbody>
</table>

Objective 1: To describe how an individual forms predispositions toward genetically modified Organisms (GMOs) by self-evaluating the safety, quality, and social functions of GMOs.

As presented in Table 4-2, mass media like newspapers, radio, and television (69.8%, n=30) are the main resource for students to get the knowledge related to genetically modified organisms. Classes and science-related programs (62.8%, n=27) along with discussion among people around respondents (55.8%, n=24) are the following two predominated information sources. A total of 12 (27.9%) respondents believed that part of their ideals related to GMOs came from perceived public opinion.
Information source (At most three options) | n | %
---|---|---
Though mass media (newspaper, radio, television, etc.) | 30 | 69.8
Class/science-related program | 27 | 62.8
Discussion among people around me | 24 | 55.8
(perceived) public opinion (i.e., I think it is the opinion of most people) | 12 | 27.9
Banner News on the Internet | 8 | 18.6
Exclusive website (Pro-/anti-GMO website) | 7 | 16.3
Family or religious beliefs | 2 | 4.7

Table 4-2: Information Source

As shown in Table 4-3, an overall mean of 4.44 (n=43) indicated that students of the Ohio State University have a slightly favorable attitude toward genetic modification (GM) or GM food products. Considering how different communication channels work in students forming the predisposition toward GM food products, the effect of family or religious belief was considered as the largest in the GMOs related issues with a mean of 6.00 (n=2, SD=1.41), followed by banner news on the internet (M=4.62, n=8, SD=1.77), class and science-related program (M=4.44, n=27, SD=1.76), discussions among people around respondents (M=4.42, n=24, SD=1.69), exclusive Pro-GMO or Anti-GMO websites (M=4.29, n=7, SD=2.06), and mass media (M=4.12, n=157, SD=1.65). A mean
of 4 or higher indicated that each of the communication channels had moderate effect on the formation of positive attitudes toward GM food products.

Perceived public opinion (M=3.92, n=12, SD=1.62) were regarded as the communication channel which make respondents form the unfavorable attitude toward GM food products. A mean smaller than 4 indicated that such communication channels might lead to the formation of negative attitudes toward GM food products.

<table>
<thead>
<tr>
<th>Communication Channel</th>
<th>n</th>
<th>Mini</th>
<th>Max</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall attitude toward GMOs</td>
<td>43</td>
<td>1</td>
<td>7</td>
<td>4.40</td>
<td>1.58</td>
</tr>
<tr>
<td>Family or religious beliefs</td>
<td>2</td>
<td>5</td>
<td>7</td>
<td>6.00</td>
<td>1.41</td>
</tr>
<tr>
<td>Banner News on the Internet</td>
<td>8</td>
<td>5</td>
<td>6</td>
<td>4.62</td>
<td>1.77</td>
</tr>
<tr>
<td>Class/science-related program</td>
<td>27</td>
<td>1</td>
<td>7</td>
<td>4.44</td>
<td>1.76</td>
</tr>
<tr>
<td>Discussion among people around me</td>
<td>24</td>
<td>1</td>
<td>7</td>
<td>4.42</td>
<td>1.69</td>
</tr>
<tr>
<td>Exclusive website (Pro-/anti-GMO website)</td>
<td>7</td>
<td>2</td>
<td>7</td>
<td>4.29</td>
<td>2.06</td>
</tr>
<tr>
<td>Through Mass Media</td>
<td>30</td>
<td>1</td>
<td>6</td>
<td>4.20</td>
<td>1.58</td>
</tr>
<tr>
<td>(perceived) public opinion (i.e., I think it is the opinion of most people)</td>
<td>12</td>
<td>2</td>
<td>6</td>
<td>3.92</td>
<td>1.62</td>
</tr>
</tbody>
</table>

Table 4-3: Mean for Importance of Communication Channels (7 Items)
An individual’s self-evaluated predisposition to GM food products was directly measured on a 7-point scale ranging from anti-GMO (1) to pro-GMO (7). A high overall mean (5-7) illustrates a positive attitude toward GM, while a low overall mean (1-3) illustrates a negative attitude. As showed in Table 4-4, 30.2% (n=13) respondents were majored in arts and social sciences like art education, finance and history, and 30.2% (n=13) respondents were majored in engineering like electronic engineering and food science. Another 39.5% (n=17) were majored in science like statics. The self-evaluated attitudes toward GMOs by those who in the major of arts and social sciences, engineering and sciences were 3.85 (SD=1.76), 4.83 (SD=1.19), and 4.56 (SD=1.63) separately.

<table>
<thead>
<tr>
<th>Course classification</th>
<th>n</th>
<th>%</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts and Social Sciences</td>
<td>13</td>
<td>30.2</td>
<td>3.85</td>
<td>1.76</td>
</tr>
<tr>
<td>Engineering</td>
<td>13</td>
<td>30.2</td>
<td>4.83</td>
<td>1.19</td>
</tr>
<tr>
<td>Science</td>
<td>17</td>
<td>39.5</td>
<td>4.56</td>
<td>1.63</td>
</tr>
<tr>
<td>Total</td>
<td>43</td>
<td>100</td>
<td>4.4</td>
<td>1.58</td>
</tr>
</tbody>
</table>

Table 4-4: Mean for self-evaluated predisposition towards GMOs

An individual’s predisposition to GM or GM food products were directly measured on a 5-point Likert-type scale ranging from strongly disagree (1) to strongly agree (5). A high overall mean (4-5) illustrates a positive attitude toward GM, while a low overall mean (1-2) illustrates a negative attitude. Results showed in Table 4-5 indicated that when considering the quality issues, respondents slightly agree that genetic
modification makes food products more nutritional (M=3.5, n=240, SD=1.14), and has the potential provide edible plant vaccines that could be used to immunize individuals against a wide variety of infectious diseases (M=3.42, n=240, SD=.86). In terms of social responsibility issues, respondents believed that the technology of genetic modification could solve the global hunger problem (M=3.64, n=240, SD=1.15), while they also regarded that such technology is not environmentally friendly (M=2.85, n=240, SD=1.12). So far as safety issues, respondents did not agree with the idea that GMOs could not be safe because they were not natural (M=2.50, n=240, SD=1.33), but they agreed that GMOs have some potential risks (M=3.15, n=240, SD=1.12).

<table>
<thead>
<tr>
<th>Statement of GMOs</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genetic modification can actually improve the nutritional content of some food,</td>
<td>43</td>
<td>3.75</td>
<td>1.08</td>
</tr>
<tr>
<td>for example low linoleic acid canola oil can reduce trans fat content. (Quality)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GMOs cannot be safe because they are not natural (Safety)</td>
<td>43</td>
<td>2.58</td>
<td>1.26</td>
</tr>
<tr>
<td>GMOs have the potential to provide edible plant vaccines that could be used to</td>
<td>43</td>
<td>3.38</td>
<td>.95</td>
</tr>
<tr>
<td>immunize individuals against a wide variety of infectious diseases (Quality)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4-5: Mean for Predispositions toward GMOs and their corresponding variable
Table 4-5: Continued

<table>
<thead>
<tr>
<th>Statement</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genetically modified crops can solve the global hunger problem due to its high-yield (Social Responsibility)</td>
<td>43</td>
<td>3.74</td>
</tr>
<tr>
<td>GMOs have some potential damage to our health. For example, it can cause allergies (Safety)</td>
<td>43</td>
<td>3.32</td>
</tr>
<tr>
<td>GMOs are environment-friendly (Social Responsibility)</td>
<td>43</td>
<td>2.88</td>
</tr>
</tbody>
</table>

In order to understand how the consideration of safety, quality, and social responsibility influences the formation of an individual’s predisposition toward GM food products, a regression analysis was applied \((r=0.834; R^2=0.695)\). In this case, 69.5% of the total variance is explained and the remaining 30.5% is unexplained. The predictive predisposition toward GM food product was assumed to follow the function of consideration of safety, quality, and social responsibility as the following Least Squares Prediction Equation with the standard error of the estimate of 0.909. In other words, the total error with infinity cases to account for, in this case 0.909 (Table 4-6).

\[
Y' = 0.578X_1 + 0.572X_2 + 0.649X_3 - 1.525
\]
Where \(X_1\) is the safety; \(X_2\) is quality; \(X_3\) is social responsibility; \(Y'\) is the overall attitudes toward GMOs.
Table 4-6: Consideration of Safety, Quality, and Social Responsibility Related to Overall Attitudes toward GMOs

<table>
<thead>
<tr>
<th></th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
</tr>
<tr>
<td>(Constant)</td>
<td>-1.525</td>
<td>.707</td>
</tr>
<tr>
<td>Safety</td>
<td>.578</td>
<td>.158</td>
</tr>
<tr>
<td>Quality</td>
<td>.572</td>
<td>.225</td>
</tr>
<tr>
<td>Social Responsibility</td>
<td>.649</td>
<td>.174</td>
</tr>
</tbody>
</table>

a. Dependent Variable: The overall attitudes GMOs

Objective 2: To describe how the audience’s predisposition toward GMOs influences the effectiveness of persuasive messages when audiences are exposed to the message.

To further expand this objective in the results, it has been broken into two parts: selectivity and passive exposure.

Objective 2a: To explore how the audience’s predisposition toward GMOs influences their behavior in selectivity process.

Selectivity process in this study included selective exposure and selective perception. Selective exposure was measured by participants’ preference among some certain message topics. As showed in Table 4-7, the majority, 51.2% (n=22) respondents preferred a GMO-related headline “A debate between Pro- and Anti- GMO” followed by
“2000+ Reasons Why GMO Are Safe to Eat- And Environmentally Sustainable” (20.9%, n=9), “GMO: Seed of Death” (16.3%, n=7), “GMO: A Kind of Contamination” (9.3%, n=3), and “Why Are We Pro-GMOs” (2.3%, n=1).

<table>
<thead>
<tr>
<th>Selective exposure</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Debate Between Pro- and Anti- GMO</td>
<td>22</td>
<td>51.2</td>
</tr>
<tr>
<td>2000+ Reasons Why GMO Are Safe to Eat- And Environmentally Sustainable</td>
<td>9</td>
<td>20.9</td>
</tr>
<tr>
<td>GMO: Seed of Death</td>
<td>7</td>
<td>16.3</td>
</tr>
<tr>
<td>GMO: A Kind of Contamination</td>
<td>3</td>
<td>9.3</td>
</tr>
<tr>
<td>Why Are We Pro-GMOs</td>
<td>1</td>
<td>2.3</td>
</tr>
</tbody>
</table>

Table 4-7: Audience’s Preference for GMO-Related Topics

Selective perception was measured by participants’ extent of disparagement of each statement related to GMO. A 5-point Likert-type scale ranging from strongly disagree (1) to strongly agree (5) was applied. Table 4-8 shows that respondents believed that GM food products could create an essential sustainable way to feed the world (M=3.76, n=43, SD=1.09). They also believed that compared to the harms GM food products might cause, the benefits outweigh any harm (M=3.36, n=43, SD=1.08). They considered that GM food products might have favorable flavor (M=3.71, n=43, SD=1.03),
but they were not sure whether GM food products have higher nutrition (M=2.94, n=43, SD=1.09)

<table>
<thead>
<tr>
<th>Selective Perception</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>GM food products can create an essential sustainable way to feed the world</td>
<td>43</td>
<td>3.76</td>
<td>1.04</td>
</tr>
<tr>
<td>GM food products have favorable flavor</td>
<td>43</td>
<td>3.71</td>
<td>1.03</td>
</tr>
<tr>
<td>On balance, the benefits of genetically modified foods outweigh the harms</td>
<td>43</td>
<td>3.36</td>
<td>1.08</td>
</tr>
<tr>
<td>GM food products have higher nutrition</td>
<td>43</td>
<td>2.94</td>
<td>1.09</td>
</tr>
</tbody>
</table>

Table 4-8: Mean for Selective Perception

In Table 4-9, a Pearson correlation showed a high and positive relationship between respondents pre-existing attitudes toward GM food products and their evaluation of specific GMOs truths at the .01 level of significance. The correlation coefficient (r.) between respondents’ self-evaluated attitudes toward GMOs and their agreement with GMO truths like higher nutrition, sustainability, and more benefits than harms is .640, .582, and .641 respectfully.
GM food products have higher nutrition .640**

On balance, the benefits of genetically modified foods outweigh the harms .641**

GM food products can create an essential sustainable way to feed the world .582**

**. Correlation is significant at the 0.01 level (2-tailed).

Table 4-9: Correlation between Pre-existing attitudes and Selective Perception

Objective 2b: To explore how the audience’s predisposition toward GMOs influences their evaluation of the advertisement during the passive exposure.

The extent of attitude change was measured by what participants think of the shown advertisement, and was directly measured with 10 items using a 7-point attitudinal scale. A low overall mean (1-3) shows a negative attitude toward the advertisement, while a high overall mean (5-7) shows a positive attitude. Results of Table 4-10 indicated that respondents regarded the pro-GMO advertisement they saw in the survey as logical (M=5.27, n=43, SD=1.61), educational (M=5.00, n=43, SD=1.65), informative (M=5.19, n=43, SD=1.60), and useful (M=5.00, n=43, SD=1.50). However, they judged this pro-GMO advertisement as neither factual nor non-factual (M=4.31, n=43, SD=1.59), neither attractive or unattractive (M=3.81, n=43, SD=1.92), neither desirable nor undesirable
(M=4.38, n=43, SD=1.77), neither stimulating nor non-stimulating (M=4.31, n=43, SD=1.74), and neither informational nor emotional (M=4.35, n=43, SD=1.81). Overall, they thought of this advertisement is quite neutral, neither pro-GMO nor anti-GMO (M=4.93, n=43, SD=1.98).

<table>
<thead>
<tr>
<th>Attitude</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logical</td>
<td>43</td>
<td>5.27</td>
<td>1.61</td>
</tr>
<tr>
<td>Informative</td>
<td>43</td>
<td>5.19</td>
<td>1.60</td>
</tr>
<tr>
<td>Educational</td>
<td>43</td>
<td>5.00</td>
<td>1.65</td>
</tr>
<tr>
<td>Useful</td>
<td>43</td>
<td>5.00</td>
<td>1.50</td>
</tr>
<tr>
<td>Pro-GMO (Perceived)</td>
<td>43</td>
<td>4.93</td>
<td>1.98</td>
</tr>
<tr>
<td>Desirable</td>
<td>43</td>
<td>4.38</td>
<td>1.77</td>
</tr>
<tr>
<td>Informational</td>
<td>43</td>
<td>4.35</td>
<td>1.81</td>
</tr>
<tr>
<td>Factual</td>
<td>43</td>
<td>4.31</td>
<td>1.59</td>
</tr>
<tr>
<td>Stimulating</td>
<td>43</td>
<td>4.31</td>
<td>1.74</td>
</tr>
<tr>
<td>Attractive</td>
<td>43</td>
<td>3.81</td>
<td>1.92</td>
</tr>
</tbody>
</table>

Table 4-10: Evaluation of pro-GMO Advertisement

In the Table 4-1a, a Pearson correlation showed that the logical power, educational power, informative power, factual power, useful power, and stimulating power of the advertisement evaluated by respondents are highly correlated to respondents’ predisposition toward GMOs. The relevant correlation coefficient (r.) is .416, .220, .448, .505, .468, and .380 respectfully. There was a low and positive relation between the predisposition and the evaluation of desirable power. Meanwhile,
Table 4-10 also shows a low and negative relationship between predisposition and respondents judgments of the advertisement as emotional ($r = -.149$) and pro-GMO ($r = -.184$).

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Predisposition (Pro-GMOs or Anti-GMOs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factual</td>
<td>.505**</td>
</tr>
<tr>
<td>Useful</td>
<td>.468*</td>
</tr>
<tr>
<td>Informative</td>
<td>.448*</td>
</tr>
<tr>
<td>Logical</td>
<td>.416*</td>
</tr>
<tr>
<td>Stimulating</td>
<td>.380</td>
</tr>
<tr>
<td>Educational</td>
<td>.220</td>
</tr>
<tr>
<td>Attractive</td>
<td>.155</td>
</tr>
<tr>
<td>Desirable</td>
<td>.142</td>
</tr>
<tr>
<td>Emotional</td>
<td>-.149</td>
</tr>
<tr>
<td>Pro-GMOs (Perceived)</td>
<td>-.184</td>
</tr>
</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed).
* . Correlation is significant at the 0.05 level (2-tailed).

Table 4-11: Correlation between Predisposition toward GMOs and Evaluation of the pro-GMO Advertisements.

**Objective 3: To describe the difference in effectiveness of messages by their formats.**

The effectiveness of the advertisement was measured directly by the recall of the advertisement from respondents. As illustrated in Table 4-12, 67.4% respondents (n=29) might read the text in the advertisement, while 32.6% respondents (n=14) might not. Among them, 55.8% (n=24) might accept the content of advertisement text after reading it, while 39.5% (n=17) accepted the information delivered through the image. Compared...
to the power of attraction, the majority, 95.3% (n=41) were attracted by the photo first, while 2.3% (n=1) respondents were attracted by text first, and 2.3% respondents (n=1) thought that there was no difference between image and text. As far as the effectiveness of the advertisement, 95.3 % (n=41) would not change his or her idea based on this advertisement solely.

<table>
<thead>
<tr>
<th>The component agree with</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>The photo</td>
<td>17</td>
<td>39.5</td>
</tr>
<tr>
<td>The text</td>
<td>24</td>
<td>558</td>
</tr>
<tr>
<td>Everything</td>
<td>2</td>
<td>4.7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The component of the advertisement caught your attention first</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>The photo</td>
<td>41</td>
<td>95.3</td>
</tr>
<tr>
<td>The text</td>
<td>1</td>
<td>2.3</td>
</tr>
<tr>
<td>Everything</td>
<td>1</td>
<td>2.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Would your attitude change?</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>2</td>
<td>4.7</td>
</tr>
<tr>
<td>No</td>
<td>41</td>
<td>95.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Did you read the text?</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>29</td>
<td>67.4</td>
</tr>
<tr>
<td>No</td>
<td>14</td>
<td>32.6</td>
</tr>
</tbody>
</table>

Table 4-12: Reaction to Different Components of Advertisement

Furthermore, in the Table 4-13, results illustrated that 44.2% (n=19) were reported to have a positive attitude toward but a negative behavioral intention toward GM
food products. Of respondents, 20.9% (n=9) report to have both positive attitude and positive behavioral intention toward GMOs. A total of 18.6% (n=8) thought of GM food products as quite harmful but they would like to buy them. However, 16.4% (n=7) would not be willing to buy GM food products because they regarded them as harmful.

<table>
<thead>
<tr>
<th>Attitude change and behavioral intention</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>I think they are good and I prefer to buy them</td>
<td>9</td>
<td>20.9</td>
</tr>
<tr>
<td>I think they seems good but I prefer not to buy them</td>
<td>19</td>
<td>44.2</td>
</tr>
<tr>
<td>I think they are harmful and I prefer not to buy them</td>
<td>7</td>
<td>16.3</td>
</tr>
<tr>
<td>I think they may be harmful but I can buy them</td>
<td>8</td>
<td>18.6</td>
</tr>
</tbody>
</table>

Table 4-13: Attitude Change and Behavioral Intention after Reading the Advertisement

**Post Hoc Analysis of Advertisement Effectiveness**

Further data analysis explored the difference in advertisement effectiveness between those who read text and those who did not. As shown in Table 4-14, among those who read the text of the advertisement, 24.1% (n=7) thought that GM food products should be good and preferred to buy them, while 37.9% (n=11) would not buy GM food products though they thought those foods should be good. A total of 17.2% (n=5) would like to buy GM food products, though they think they might cause some harm, while 20.7% (n=6) would not buy those foods due to perceived harm. On the other hand, among those
who did not read the text, 9.1% (n=1) respondents held positive attitudes and negative behavioral intention toward GM food products, 57.9% (n=8) held positive attitude but negative intention toward GM food products. 21.4% (n=3) held negative attitude and negative behavioral intention, while 14.2% (n=2) held negative attitude but positive intention.

In addition, for those who read the text, 96.6% (n=28) were reported not to change the attitude toward GM food products completely after reading the advertisement. Similarly for those who did not read the text, 92.8% reported no change in attitude.

<table>
<thead>
<tr>
<th>Attitude after Reading the Advertisement</th>
<th>Reading the Text</th>
<th>Not Reading the Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>I think they are good and I prefer to buy them</td>
<td>7</td>
<td>24.1</td>
</tr>
<tr>
<td>I think they seems good but I prefer not to buy them</td>
<td>11</td>
<td>37.9</td>
</tr>
<tr>
<td>I think they are harmful and I prefer not to buy them</td>
<td>5</td>
<td>17.2</td>
</tr>
<tr>
<td>I think they may be harmful but I can buy them</td>
<td>6</td>
<td>20.7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Attitude Changed or Not Post Advertisement</th>
<th>Reading the Text</th>
<th>Not Reading the Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>1</td>
<td>3.4</td>
</tr>
<tr>
<td>No</td>
<td>28</td>
<td>96.6</td>
</tr>
<tr>
<td>Total</td>
<td>29</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 4-14: Post Exposure Attitude towards GMOs
Summary

In this chapter, frequencies described personal demographics of the young consumers who completed the survey. Statistics also represented the popularity of different communication channels among students of The Ohio State University in the GMOs related issues and their effect.

Overall, students of The Ohio State University had a slight positive attitude toward GM food products. Young consumers believed that GM food products might be good based on the promised safety, higher quality, and social responsibility. As a result, they were more likely to be actively exposed to pro-GMO messages and less likely to disparage related messages. If exposed passively to the pro-GMO messages, they were also likely to positively evaluate them. Despite a favorable attitude toward GMOs, students reported a more negative behavioral intention to purchasing GM food products. They were not willing to buy it though they quite agree with the content of pro-GMO advertisements. In addition, in the GMO issues, images are more powerful in attracting audience, while text is more powerful in convincing the audience.
Chapter 5 Discussion

The purpose of this study was to explore how customers engage in a pro-GMO advertisement based on their pre-existing knowledge about GMOs under the theoretical framework of the Theory of Planned Behavior and the Elaboration likelihood model. This study hypothesized that an individuals’ pre-existing knowledge about GMOs would act as a key factor to their engagement. It aimed to focus on the interaction between audience’s predisposition toward GM food products and persuasive messages of GM food products during both active and passive message processing. It also explored how an individual forms predispositions toward genetically modified organisms by self-evaluating the safety, quality, and social functions of GMOs. This chapter explains conclusions from the data and offers recommendations to practitioners and for future research.
Conclusions

Objective 1: To describe how an individual forms predispositions toward genetically modified Organisms (GMOs) by self-evaluating the safety, quality, and social functions of GMOs.

An overall mean of 4.40 (n=43) indicated that students of the Ohio State University have a neutral, tending to positive, predisposition toward Genetic Modification or GM food products. Furthermore, students in science and engineering majors hold comparatively favorable attitudes toward GMOs (M=4.56 and M=4.83), while those in arts and social sciences majors hold less favorable attitudes toward GMOs (M=3.85). This result represented that customers’ attitudes toward GM food products has changed in the past 10 years; or it shows that younger consumers may not feel the same way about food as their parents. Costa-Font et al. (2007) found the customers’ attitudes toward GMOs in the U.S. were quite similar to ones in Europe based on several studies published before 2007 related to worldwide consumer attitudes to GM technology. Gaskell (2006) found a public skepticism in GMO issues. Based on the 2005 data, he pointed out that consumers could be divided into three groups by their perception of GM technology: optimistic (25%), pessimistic (58%), and undecided (17%). Some other studies also confirmed that U.S. students were more willing to buy to food products without GMOs (Onyango & Govindasamy, 2004).
However nowadays, young consumers seemed to have a more favorable attitude toward GMOs. The result of this study was not surprising since that Despain (2015) reported that according to a phone survey analysis by Pew Research Center (PRC), education and gender functioned more powerfully to influence the acceptance of GM crops than politics and religion did. The PRC survey found that individuals with higher education and greater science knowledge were more likely to consider GM food products as safe.

In addition, this research on communication channels showed mass media like newspapers, television, and radio were the main channel for young consumers to find information related to GMO, but it did not function a lot in forming positive predispositions toward GMOs (M=4.20) if compared to the average attitude toward GMOs (M=4.40). However interpersonal communication channels like family or religions (M=6.00), and discussion among peers (M=4.42) had a higher effect on the formation of favorable predisposition. This was not surprising since Rogers (1962, 2005) pointed out that mass media channels and interpersonal channels have different functions during different stages of innovation diffusing process. Transmitting information through mass media could create awareness knowledge and increase information to many potential adopters. On the other hand, interpersonal communication channels like face-to-face exchange were more effective in persuading others to accept the new idea or technology. If two or more individuals involved in the interpersonal communication channels have similar demographic characteristic like socioeconomic status or
educational background, the effectiveness might increase. In other words, mass media channels were effective in spreading new ideas while interpersonal communication channels were effective in persuading target audiences to accept new ideas.

Class and science-related programs are secondary sources for young consumers to learn about GMOs, and these sources also work in forming favorable attitudes toward GMOs. One explanation of this phenomenon might be that the interactivity in the class makes students remember more information than they did when reading media. In addition, although banner news on the Internet did not appear as a main source for young customers to learn about GMOs, the Internet had an influence in positive attitude formation (M=4.62). The increasing interactivity of media might work as the catalyst of this phenomenon. It is widely accepted that the interaction between persuasive messages and audiences may influence the persuasive effect of messages (Oh & Sundar, 2015). Sundar et.al (2013) claimed that user engagement with the persuasive content, a psychological state in which users are cognitively or emotionally involved in a task, was positively correct with interactivity (Oh & Sundar, 2015). For example, the web, unlike traditional mass media such as newspaper and radio, provides users with possibility to interact with information, rather than only transmit it.

This study also showed how the consideration of safety, quality, and social responsibility influence the formation of young consumers’ predispositions. The Least Squares Prediction Equation showed that social responsibility (B=.649), safety (B=.578), and quality (B=.572) were similarly important in the attitude formation of GMOs issues.
This is similar to the piece of Hughner et al (2007). It found that safety promise, higher quality, and social responsibility are main motivates for consumers to purchase organic food, after reviewing several related studies.

**Objective 2: To describe how the audience’s predisposition toward GMOs influences the effectiveness of persuasive messages when audiences are exposed to the message.**

In terms of consumers’ behavior in selective exposure and selective perception, 23.2% reported to prefer article topics that imply pro-GMO content, while 25.6% reported to prefer ones which imply anti-GMO content. Of respondents, 51.2% preferred a neutral topic. According to the average score of self-evaluated overall attitudes toward GMOs, there was neither absolute pro-GMO nor anti-GMO attitude, with the tendency being slightly pro-GMO (M=4.40). Meanwhile, the Pearson correlation between the evaluation of one’s own overall attitude toward GMOs and their agreement to several GMO truths illustrated that young consumers with more positive pre-existing attitudes toward GMOs would be more likely to agree with or accept statements claiming advantages of GMOs. This was not surprising since consistency theories revealed that there was a strong tendency for people to maintain consonance (Petty & Cacioppo, 1981). Balance Theory, one of the consistency theories, assumes that attitude change results from motivational rather than learning or judgmental processes (Heider, 1946). People were more willing to agree with someone they like or disagree with someone they dislike.
Several studies found the biased information seeking process happened in different contexts. Individuals would prefer information, which is consistent with their beliefs and pre-existing attitudes, and would ignore such inconsistent information (Fischer et al., 2005). Hwang (2010) found that compared to weak smokers, heavy smokers were much easier to disparage anti-tobacco campaign messages though there was no significant correlation between smoking status and extent of exposure to anti-tobacco campaign messages.

When passively exposed to a Pro-GMO advertisement, young consumers with more positive predisposition toward GM food products were more likely to evaluate the advertisement. They regarded it as logical ($r = .416$), educational ($r = .220$), informative ($r = .448$), factual ($r = .505$), useful ($r = .468$), and stimulating ($r = .380$). Although they think of it as informational rather than emotional ($r = .149$) and not considerably desirable ($r = .142$), they do not think it as an absolute pro-GMO advertisement ($r = -.184$). This accounts for the ceiling effect. That means the understanding of GMOs is already very high based on repeated exposure to similar content through different channels, and as a result, exposure to the advertisement with similar content may not have room to further influence perception. Byrne et al. (2015) found a ceiling effect on health risk beliefs and the difference in fear perceptions and effectiveness stimulated by various cigarette-warning labels. In other words, warning labels are all succeeded in conveying factual and informal information but differ in persuasive power. On the other hand, it might also account for the rare engagement of respondent with the advertisement.
Objective 3: To describe the difference in effectiveness of messages by their formats.

Comparing the effectiveness of different components of the advertisement, 95.3% respondents were attracted by the image first, while 2.3% respondents were attracted by text first. Of respondents, 2.3% thought that there was no difference between the image and text. Moreover, 67.4 % respondents read the text in the advertisement, while 32.6% respondents ignored it. Among respondents, 55.8% might accept the content of the advertisement text after reading it, while 39.5% accepted the information delivered through the image. This was surprising since that several studies have shown that images could work better in persuading target audiences than text. Byrne and her colleagues (2015) found that if comparing the effectiveness of cigarette warning labels, full-color graphic warning labels, black-and-white graphic warning labels, warning text (No graphic images), and Surgeon General’s warnings, there was no difference in effectiveness perception and fear perception between the full-color graphic warning and other warning labels (whatever graphic or text-based), but the mean fear perceptions of graphic warnings is higher than the one of text-based warnings. Furthermore, graphic warning labels, especially full-color labels, generated higher perceived fear and in turn, led to higher intention to quit smoking (Byrne, Katz, Mathios & Niederdeppe, 2015).

This study also illustrated that audiences might not change their original idea after reading an advertisement only once. Of respondents, 95.3 % were reported not to change his or her opinion. The lack of redundancy might account for this. Especially during the
passive exposure, message repetition, a form of redundancy, is extremely important. Shannon and Weaver (1949) defined redundancy as a mathematical formula related to entropy or relative information. If a communication is “completely error-free and has an unlimited capacity in case of information overloading,” message repetition will not be needed. So message repetition here is regarded as noise-reducing and promotes the persuasive communication. McCullough and Ostrom (1974) proved a positive relationship between the attitude and the number of advertisements with the same message viewed by participants. However, Cacioppo and Petty (1979) found a curvilinear relationship between exposures to a persuasive message and attitudes toward a topic. Attitudes peaked after three exposures to the same message.

Furthermore, although respondents reported to have a slightly positive attitude toward GM food products, they might not take action to buy them in their daily life. While 20.9% reported to have both positive attitudes and positive behavioral intentions toward GMOs, 44.2% reported to have a positive attitude toward but a negative behavioral intention toward GM food products. A total of 16.4% (n=7) would not be willing to buy GM food products because they regarded them as harmful. This was not surprising since that several studies have shown that attitude could not work as the only predictor of behavior, and it is only a part of behavior change system (Lapiere, 1934; Ajzen and Fishbein, 1977). Festinger (1964) argued the correlation between attitude and behavior was limited. He found that only three studies showed an effect of attitude change on subsequent behavior change. Furthermore, Wicker (1969) suggested that
attitudes should be unrelated to behavior based on the fact that the average correlation between attitude and behavior of over 30 studies is less than 0.3. However, the Theory of Planned Behavior (TPB) assumes that the predictive behavior is mediated by behavioral intention, while behavioral intention is influenced by a person’s attitude toward performing a behavior, by subjective norms (beliefs about how individuals who are important to the person consider his or her behavior), and by perceived behavioral control (beliefs about whether individuals can control the particular behavior) (Ajzen and Fishbein, 1977; Ajzen, 1991).

The result of this study also showed that 18.6% thought of GM food products as quite harmful yet they would buy them. This might account for other characteristics like price also influenced consumers’ choice. Huffman et al. (2007) found that consumers were reported to be willing to pay 14% less for GM food products. And also, Moon et al. (2007) suggested that consumers were willing to pay a 20% premium for non-GE products and willing to accept a discount of 23% for GM food products.

Furthermore, there is a slight difference in effectiveness among those who read the text of the advertisement and those who did not. Those who read the text had a higher possibility to think that product should be good and preferred to buy them, but had a small possibility to hold negative behavioral intention with a positive attitude. Meanwhile, those who read the text would be more likely to purchase the GM food products though they regarded those foods as harmful, and would be less likely to hold a negative attitude and a negative intention. In other words, for the young adults with moderate involvement,
the attractive image of the advertisement might limited them to be exposed to the text information. As a result, their decision were mainly depended on the information delivered through the image. However, if they had an opportunity to be exposed to a text with good quality, they would be persuaded more easily based on the information of the text.

Limitations

A few of limitation of this study should be noted. The sample is limited in variety and volume. The study sampled students from The Ohio State University. Many of the demographic variables such as age, education, and experience with GMOs were similar for all respondents to the survey. Therefore, it was not possible to generalize the findings to any other population outside of the Ohio State University. Because the data was collected by survey, the findings only represent the period during which the survey was completed. Meanwhile, the accuracy of the conclusion was relied on the assumption that respondents would like to report their true opinions. Furthermore, the sample is small due to the lack of respondents. All conclusions made related to these variables must be made with caution.
Recommendations

Recommendations for Research

The data collection method used in this study was an online survey only and as a result, the process is comparatively passive. For future studies it is recommend that the survey be distributed via both online and face-to-face exchanges to a larger sample. This would also go a long way in increasing the response rate, allowing for more statistical analysis.

The results of this study provide insight into young consumers’ formation of attitude toward genetic modification and GM food products, and the communication channels they use to acquire the GMO-related knowledge. The research suggests that mass media channels, classes and science-related programs, interpersonal communication channels, and the Internet (Including banner news and exclusive webpages) are main sources for young consumers to get information, and these channels lead audiences to forming a slight favorable attitude toward GM food products. However, it only describes how consumers acknowledge the information. Future research is needed to understand consumers’ engagement in the GMO-related issues. For example, research can be conducted to explore how young consumers discuss GMOs and related topics on social media, which has gradually become a part of people’s daily life since it was introduced in 1997. To some extent, social media is also a kind of combination of both mass media
channels and interpersonal communication channels. Through social media like Twitter and Facebook, users are provided with a feeling of being connected with others by interacting with their family and friends and by representing ideals with receiving them from others through those sites (Mazali, 2011).

On the other hand, although all these information sources are positively related to the attitude formation, the average score for people perceived public opinion still maintains low. That means, the audience thinks that most people in society may not support GM food products. As a result, future data analysis could be conducted to understand such gaps between perceived public opinion and information delivered via communication channels.

Meanwhile, the results of this study also showed that at average, young consumes hold a slight positive attitude toward GM food products based on the consideration of social responsibility, quality, and safety, but a comparatively negative intention to behavior. Future research could be done to explore how other factors function practically in the attitude and behavior gap.

According to the post hoc analysis of advertisement effectiveness, images are more powerful in attracting audiences, while texts are more powerful in convincing audience. But the image used in this study is negative and the text is positive. A future 2 (negative image verse positive image) * 2 (positive text verse negative image) study are need to find whether the different combinations will influence the consequence. Meanwhile, researchers should also continue to explore that whether the style of text,
story-telling, and statistical information in numeric formats, might influence the effectiveness of the advertisement, or whether the number of words, more than and less than 140, also might influence the effectiveness.

**Recommendations for Communicators**

Classes and scientific programs have been shown to be highly and positively correlated to GMO-related attitude formation. Educators and communicators should continue to develop this method to reach young and potential GM food product consumers.

Findings also provide evidence that with GMO issues, mass media channels could reach more potential consumers, while interpersonal communication channels could be more effective in persuading people to adopt GM food products. Communicators could take advantage of features to design a strategy to combine both kinds of these channels. Newspapers and online news might work as complementary channels in science communication. Weeks et al. (2012) pointed out that online information about controversial science and technology could be triggered by related news coverage (Weeks, Friedenberg, Southwell, & Slater, 2012). Becker et al. (2010) also found that a positive relationship between individuals’ attention to information on both newspaper and online news and the their support for related scientific research.

Knowing that with GMO issues, images are more powerful in attracting an audience, while texts are more powerful in convincing an audience. Advertisers and
campaign designers should combine the features of these two kinds of formats to promote GM food products.

**Summary**

In this chapter, conclusion and recommendations were made based on the results showed in chapter 4. For researchers, a couple of future studies could be done to understand consumers’ engagement in the GMO-related issues like how young consumers discuss GMOs and related topics on social media, or to explore how other factors like prices practically function in the attitude and behavior gap.

In addition, according to the finding that the images are more powerful in attracting audiences, while texts are more powerful in convincing audience, the researcher also suggested researchers could work more to understand whether the style of text, story-telling, and statistical information in numeric formats, might influence the effectiveness of the advertisement, or whether the number of words, more than and less than 140, also might influence the effectiveness. Communicators and advertiser could also improve their campaign strategy based on the results of this study.
Reference


Appendix A: Survey Distribution E-Mail
E-mail to instructors

Subject: Survey of Student attitude towards genetically modified food products

Hi! My name is Lu, Xuerong, and I am a master student in the department of agricultural communication, education and leadership studying agricultural communication. For my thesis, I am testing the effectiveness of science advertisements related to GMO (Genetically Modified Organisms) for students, and I would like to invite the student enrolling in your class to participate in this study. I would like to know whether you could help me to send the following to your class on my behalf.

Each of the students, who voluntarily participate in this survey, will need to complete one online survey. Each survey will take approximately 20 minutes to complete and can be completed at any location with Internet access. Their email addresses and demographic information will remain confidential and will be removed from their responses after the study is complete.

As an incentive to participate, you will be entered into a raffle to win a $10 gift card for Amazon.com. This incentive is not contingent on completion of the study.

I appreciate your permission!
E-mail to the class:

Hi! My name is Lu, Xuerong, and I am a master student in the department of agricultural communication, education and leadership studying agricultural communication. For my thesis, I am testing the effectiveness of science advertisements related to GMO (Genetically Modified Organisms) for students, and I would like to invite you to participate in the this study.

In order to participate, you will need to complete one online survey. Each survey will take approximately 20 minutes to complete and can be completed at any location with Internet access. Your email address demographic information will remain confidential and will be removed from your responses after the study is complete.

As an incentive to participate, you will be entered into a raffle to win a $10 gift card for Amazon.com. This incentive is not contingent on completion of the study.

If you would like to read more information about this study or to participate, please click on the link below:

Follow this link to the Survey:

Take the Survey

Or copy and paste the URL below into your internet browser:

https://osu.az1.qualtrics.com/SE/?SID=SV_5btVJrx9lEScWfb
Appendix B: Online Survey instrument
The following survey is designed to evaluate your attitude towards genetically modified food products. The data from this survey is being collected and analyzed for a graduate student research project. Your participation in this study is voluntary. If you decide to stop participating in the study, there will be no penalty to you. Your decision to participate will not affect your future relationship with The Ohio State University. There are no anticipated risks from your participation and you will not benefit directly from participating in the study. There is no cost to you except your time.

The online survey is on a secure network and will take approximately 20 minutes to complete. During the survey you can skip any questions you feel uncomfortable answering. You will not be able to go back once you have moved forward in the survey, so please make sure all answers are final before moving to the next page.

We will work to make sure that no one sees your survey responses without approval. Identifying information will be removed from the survey and will not be shared or reported. For questions, concerns, or complaints about the study, or you feel you have been harmed as a result of study participation, you may contact Emily Buck at 614-292-4937.

For questions about your rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact Ms. Sandra Meadows in the Office of Responsible Research Practices at 1-800-678-6251.

We appreciate your time and feedback! Click the button below to provide consent
for your participation and continue with this survey study

How old are you?

17 or below       18-25       26-35       36-45       46 or above

What’s your gender?

Male       Female

What your current academic status? And what’s your major?

Undergraduate       Master       PhD       Major

Are you vegetarian?

Yes       No

How often do you go to the market to buy food product?

• More than once a week
• Once a week
• Once two week
• Three times a month
• Twice a month
• Once a month
• Less than once a month

Which characteristics of food products do you care for when buying them in the market

● Nutrition/health claim
● Non-GMO labeling
● Allergy alarm

How do you think about GMO? (1-strongly disagree; 5-strongly agree)

1. Genetic modification can actually improve the nutritional content of some foods, for example low linoleic acid canola oil that can reduce trans-fat content

2. GMOs cannot be safe because they aren’t natural

3. GMOs are potential to provide edible plant vaccines that could be used to immunize individuals against a wide variety of infectious diseases.

4. GMOs can solve the global hunger problem due to its high-yielding.

5. GMOs have some potential damage to our health. For example it is much easier to cause allergies

6. GMOs are environment-friendly.

What is your overall attitude towards GMO?
Anti-GMO _-3_ _-2_ _-1_ _0_ _1_ _2_ _3_ Pro-GMO

Where do you learn GMO?

- Through mass media (newspaper, radio, television)
- Banner news on the internet
- Exclusive website (pro-/anti-GMO website)
- Discussion among people around me
- (Perceived) public opinion
- Class/science-related program

Participants will be exposed to a pro-GMO advertisement and then answer the following questions. (Showed in Appendix D)

The advertisement which I just read is:

<table>
<thead>
<tr>
<th>Not logical</th>
<th>Logical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not educational</td>
<td>Educational</td>
</tr>
<tr>
<td>Not informative</td>
<td>Informative</td>
</tr>
<tr>
<td>Not factual</td>
<td>Factual</td>
</tr>
<tr>
<td>Not useful</td>
<td>Useful</td>
</tr>
<tr>
<td>Not attractive</td>
<td>Attractive</td>
</tr>
<tr>
<td>Not desirable</td>
<td>Desirable</td>
</tr>
<tr>
<td>Not stimulating</td>
<td>Stimulating</td>
</tr>
</tbody>
</table>
Most informational

Mostly emotional

Pro-GMOs

Anti-GMOs

Which component of the advertisement did you agree with?

- The photo
- The text
- Everything

Which component of the advertisement caught your attention first?

- The photo
- The text
- Everything

Do you feel that this advertisement change your opinion?

- Yes
- No
Did you read the text on the advertisement?

- Yes
- No

If you are search for the information of GMO on the internet, which title following is most attractive to you? Selective exposure

- Why Are We Pro-GMO?
- 2000+ Reasons Why GMOs Are Safe To Eat And Environmentally Sustainable
- A Debate Between Pro- and Anti- GMO
- GMO: Seed of Death
- GMO: A kind of Contamination

The extent to which you agree that each of following statement is convincing? (1- strongly disagree; 5- strongly agree)

<table>
<thead>
<tr>
<th>STATEMENT</th>
<th>SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>GM food products have higher nutrition</td>
<td></td>
</tr>
<tr>
<td>GM food products have unfavorable flavor</td>
<td></td>
</tr>
</tbody>
</table>
GM foods can create an essential sustainable way to feed the world

On balance, the benefits of genetically modified foods outweigh the harms.

What is your attitude towards GMO now?

- I think it is good and I would to buy it.
- I believe what scientists promise to some degree. I think it seems good but I would like to not buy it.
- I don’t believe what scientists promise. I still think it is harmful and I would like to not buy it
- I think it may be harmful but I can buy it.
Appendix C: Research Approval from Institutional Review Board
02/12/2016

Study Number: 2015B0494
Study Title: the effect of audience’s predisposition GM foods promotion activity

Type of Review: Initial Submission

Review Method: Expedited

Date of IRB Approval: 02/11/2016
Date of IRB Approval Expiration: 02/11/2017

Expedited category: #7

Dear Emily Buck,

The Ohio State Behavioral IRB APPROVED the above referenced research.

In addition, the following were also approved for this study:

- Waiver of Consent Documentation

As Principal Investigator, you are responsible for ensuring that all individuals assisting in the conduct of the study are informed of their obligations for following the IRB-approved protocol and applicable regulations, laws, and policies, including the obligation to report any problems or potential noncompliance with the requirements or determinations of the IRB. Changes to the research (e.g., recruitment
procedures, advertisements, enrollment numbers, etc.) or informed consent process must be approved by the IRB before implemented, except where necessary to eliminate apparent immediate hazards to subjects.

This approval is issued under The Ohio State University's OHRP Federalwide Assurance #00006378 and is valid until the expiration date listed above. **Without further review, IRB approval will no longer be in effect on the expiration date.** To continue the study, a continuing review application must be approved before the expiration date to avoid a lapse in IRB approval and the need to stop all research activities. A final study report must be provided to the IRB once all research activities involving human subjects have ended.

Records relating to the research (including signed consent forms) must be retained and available for audit for at least 5 years after the study is closed. For more information, see university policies, [Institutional Data](#) and [Research Data](#).

Human research protection program policies, procedures, and guidance can be found on the [ORRP website](#).

Michael Edwards, PhD, Chair  
Ohio State Behavioral IRB
Appendix D: Advertisement Exposed to the Audience
It is frequently claimed that GM foods are not properly tested, or that few independent studies have been published to establish their safety. Another similar claim made is that the food regulatory agencies rely exclusively of corporate information to decide whether GM food and feed are safe. The further claim is made that very few independent tests relating to GM food safety are done.

This conventional 'wisdom' is inaccurate. Currently there are nearly 2,000 peer-reviewed reports in the scientific literature that document the general safety and nutritional wholesomeness of GM foods. Every major scientific body in the U.S. and around the world, like WHO (World Health Organization) and AAAS (American Association for the Advancement of Science), have reviewed independent research related to GM crops and food and have concluded they are as safe as food and crops developed from other methods in use today. Close to 30% of these publications are produced and funded by organizations that are completely independent of large commercial seed companies. And most of these academic organizations, like AAAS, are not for profit.