Volume 16 Issue 36
Originally issued as H5



Global Journal of human-social science: H
Interdisciplinary
Volume 16 Issue 5 Version 1.0 Year 2016
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-460X & Print ISSN: 0975-587X

Quantitative Research Study: Genetically Modified Organisms: A College Student's Perspective

By Rameca Vincent Leary
Regent University

Abstract- Genetically modified organisms (GMOs) are those whose genetic material has been manipulated "artificially" in a laboratory through genetic engineering. This relatively new science creates unstable combinations of plant, animal, bacterial, and viral genes that do not occur in nature or through traditional crossbreeding methods (Non-GMO Project, 2015). With so many food options available, the aim of this study is to explore food purchasing trends of college students to determine how awareness of GMOs affects their likelihood of buying non-GMO products. Data were collected from 214 students at a southern university, using an electronic questionnaire. Results showed that even prior to survey completion; students had a relatively good knowledge of GMOs. They also felt this information would increase their likelihood of buying non-GMO products. In terms of cost, the majority agreed they would purchase non-GMO products if prices were lower. Additionally, most respondents disagreed when asked whether gender affected their perception of GMOs. Ideas for further research were also explored.

Keywords: *genetically modified organisms/gmos, perceptions, health, expectancy.*

GJHSS-H Classification: *FOR Code: 130205*



Strictly as per the compliance and regulations of:



© 2016. Rameca Vincent Leary. This is a research/review paper, distributed under the terms of the Creative Commons Attribution-Noncommercial 3.0 Unported License http://creativecommons.org/licenses/by-nc/3.0/), permitting all non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

Quantitative Research Study: Genetically Modified Organisms: A College Student's Perspective

Rameca Vincent Leary

Abstract- Genetically modified organisms (GMOs) are those whose genetic material has been manipulated "artificially" in a laboratory through genetic engineering. This relatively new science creates unstable combinations of plant, animal, bacterial, and viral genes that do not occur in nature or through traditional crossbreeding methods (Non-GMO Project, 2015). With so many food options available, the aim of this study is to explore food purchasing trends of college students to determine how awareness of GMOs affects their likelihood of buying non-GMO products. Data were collected from 214 students at a southern university, using an electronic questionnaire. Results showed that even prior to survey completion; students had a relatively good knowledge of GMOs. They also felt this information would increase their likelihood of buying non-GMO products. In terms of cost, the majority agreed they would purchase non-GMO products if prices were lower. Additionally, most respondents disagreed when asked whether gender affected their perception of GMOs. Ideas for further research were also explored.

Keywords: genetically modified organisms/gmos, perceptions, health, expectancy.

I. Introduction

It is an issue that has sparked a wave of controversy on a global scale. Should consumers be privy to ingredients in the foods they purchase, specifically those that are genetically modified? In simple terms, genetically modified organisms (GMOs) are those whose genetic material has been manipulated "artificially" in a laboratory through genetic engineering. This relatively new science creates unstable combinations of plant, animal, bacterial, and viral genes that do not occur in nature or through traditional crossbreeding methods (Non-GMO Project, 2015). While some may tout GMOs as being harmless, Geib (2012) stresses how they are linked to complications such as Morgellons disease, allergies, immune reactions, and sterility. From an agricultural perspective, Smith (2008) shares the following GMO example: "A gene from the soil bacterium called Bt (for Bacillus thuringiensis) is inserted into corn and cotton DNA, where it secretes the insect-killing Bt-toxin into every cell. About 19% of GM crops produce their own pesticide. Another 13% produce a pesticide and are herbicide tolerant" (para. 6).

Author: Regent University. e-mail: ramecaleary@aol.com

Although some farmers have chosen not to embrace GMOs, the global numbers are still rising (Jagadeesan, 2011). Smith (2008) reveals how many people digest the proteins more slowly from genetically modified foods because they also reduce the digestive enzymes in mice.

In 2013, the World Health Organization announced the transfer of the antibiotic-resistant genes inserted into GM (genetically modified) foods could also be absorbed into human cells. This news heightened negative attitudes regarding the contamination of crops, land, and water from pesticides and chemicals (Fromartz, 2006).

In our society, even the most conscious consumer may still face a conundrum because it is quite difficult to determine whether many products are "truly" non-GMO. Peterson (2011) attests, "You put one non-GMO certified ingredient into the mix and place the non-GMO certification stamp on the front label" (para. 3). Even Mark Squire (2015) of the non-GMO Project admits products cannot be verified as completely GMO free due to seed and crop contamination.

a) Purpose of Study and Theoretical Application

Realistically, there are still uncertainties surrounding GMO and non-GMO products (Van Dijk, Van Kleef, Owen, & Frewer, 2012). With so many food options available, what is a consumer to do? The purpose of this pilot study is to explore specific purchasing trends of college students at Pensacola State College in Pensacola, Fla. Will an awareness of GMO products increase their likelihood buying non-GMO items, or could other circumstances impact their decisions?

Victor Vroom's (1964) expectancy theory of motivation will offer insight into how these choices may be influenced by additional elements, whether personal or societal. The theory proposes a person decides to behave in a certain way, selecting one behavior over another, based on the "expected" result of the particular behavior (Harris & Reynolds, 2003; Lim & Dubinsky, 2004). The motivation behind a chosen behavior is determined by the desirability of the expected outcome (Zhu, Nakata, Sivakumar, & Grewel, 2013; Hemamalini & Washington, 2014). For this study, it could be expressed in relation to GMO versus non-GMO food consumption.

© 2016 Global Journals Inc. (US)

Furthermore, at expectancy theory's core is the cognitive process of how an individual processes the different motivational elements (Fu, 2009; Hemamalini & Washington, 2014). This processing is done before an individual makes the final choice (Stankovic, 2013). The expected result is not the sole determining factor in the decision of how to behave … because the person has to predict whether or not the expectation will be fulfilled (Boundless, 2014). This leaves room for influence, something this study will explore in great detail. Data will be gathered and analyzed to determine which variables impact college students' decisions to purchase non-GMO products or avoid them altogether.

II. Literature Review

Overall, the issue of GMOs has generated a great deal of interest and debate. When consumers lack a clear understanding of the GM (genetically modified) food industry, they often struggle to make informed decisions regarding the safety of foods they eat (Knight, 2007). Interestingly, for college students, reactions tend to vary. From a consumer standpoint, some researchers contend college students' perceptions of GMOs can determine the success of current products, including those launched in the future (Hugher, McDonagh, Prothero, Shultz, & Stanton, 2007).

Finkle and Kim (2003) conducted a GMO study consisting of Korean and American college students. Although the majority of both groups were concerned about health risks from GM foods, the proportion of Korean students (87%) was much higher than American students (58%). Their findings revealed "women and students who were more likely to invest in health through nutrition and exercise were also more likely to be concerned about GM foods" (Finkle & Kim, 2003, p. 191).

Lauk, Mosher and Freeman (2010) explored GMO perceptions at an undisclosed research university in the U.S. Surveys were administered to American and international college students to determine factors that may affect their perceptions of GM food products. Results indicated students born outside the U.S. had increased negative opinions about GM foods, a sharp contrast in the attitudes of American-born students. Meanwhile, those enrolled in physical science - based curriculums had more favorable opinions of GM foods, compared to those in other programs.

Research conducted at Sultan Qaboos University in India yielded mixed findings. Al-Rabaani and Al-Shuaili (2014) surveyed 460 randomly-selected students from eight programs of study. The results showed students had some knowledge of organic products, but their awareness of GM foods was poor. They had favorable opinions of organic food products and negative attitudes towards GM foods. While males had a higher level of awareness about both types of food, females tended to favor organic food products over GM options.

Batrinou, Spiliotis, and Sakellaris (2008) explored the perceptions of college students at a university in Greece. Of the 229 people surveyed, 63% had negative attitudes when viewing products labeled as GM. In contrast, food labels bearing GM and European Union (EU) approved seals were viewed in a more receptive manner. Despite the findings, 28% of all respondents still refused to embrace the idea consuming GM foods.

A study conducted in Italy, Norway, and England investigated what factors influence consumers to pay higher prices for non-GMO products. Miles, Ueland, and Frewer (2005) surveyed participants in each country. They concluded that receiving information about GMO traceability did not increase participants' trust in food regulators. However, specific knowledge about a product's full list of ingredients did. Goktolga and Esengun (2009) conducted similar research in Turkey. They administered questionnaires to 226 households. Their overarching goal was to determine whether families would be willing to pay more for non-GMO tomato crops. Results indicated that "household size and monthly household income had negative effects on the willingness to pay extra" (Goktola & Esengun, 2009, p. 1188). Meanwhile, an investigation of GM attitudes in Croatia revealed media stories used to persuade residents of the benefits of GMOs were losing their momentum. Renko, Brcic-Stipcevic, and Renco (2003) found that increased levels of skepticism by citizens triggered an elevated level of non-acceptance.

III. Research Questions

The aim of this pilot study was to gauge how a college student's knowledge of GMOs would impact their decision to purchase products containing them … or refrain from doing so altogether. Could knowledge "alone" serve as a catalyst for change, or would other factors influence their consumer decisions? Based on previous research, theoretical reasoning, and scarcity in academic literature, the following research questions are posed:

RQ1: Does a college student's knowledge of non-GMO products increase their likelihood of buying them?

RQ2: Is the desire to eat healthier enough to justify paying higher prices for non-GMO products?

RQ3: Does gender affect college students' perceptions of GMOs?

IV. Methodology

a) *Participants*

Participants for this study consisted of 214 students from Pensacola State College (PSC) in Pensacola, Fla. It is a state-supported school with six campus locations. The student sample included 96

© 2016 Global Journals Inc. (US)

males and 118 females. Ethical practices and codes of conduct were followed succinctly. Demographics for the sample such as gender, college classification by year, program of study, ethnic background, relationship status, religious affiliation, and political preference are located in Table 1.

GMO Survey: A College Student's Perspective

The survey (Appendix A) contained 35 questions that addressed the following areas: personal knowledge of GMOs, the likelihood of buying non-GMO products, factors that could hinder the decision altogether, societal knowledge of GMOs, and personal food preferences (e.g., whether GMO or non-GMO). The last section included items that did not tie in directly to the research questions, but could be used later for further data analysis. For example, two questions dealt with educational levels of respondents' parents. Another asked for students' grade point averages (GPAs). All questions were "stand alone," meaning they measured different variables. A majority were Likert-Scale items with a scale of 1-5, ranging from "Strongly Disagree" to "Strongly Agree."

Table 1: Respondents' Demographic, Educational, Religious and Political Information

Gender	College Classification by Year	Program of Study	Ethnic Background	Relationship Status	Religious Affiliation	Political Preference
Male **45%**	First Year **40%**	Undeclared **24%**	Caucasian **77%**	Single **78%**	Islamic **0%**	Conservative **34%**
Female **55%**	Second Year **39%**	Interdisciplinary **2%**	Asian-American **6%**	Married **16%**	Jewish **0%**	Moderate **48%**
	Third Year **15%**	Education **8%**	African-American **6%**	Widowed **0%**	Hindu **0%**	Liberal **18%**
	Fourth Year **4%**	Christian Studies **0%**	Hispanic American **6%**	Divorced/ Separated **6%**	Buddhist **3%**	
	Fifth Year + **2%**	Fine Arts **7%**	Other **6%**		Christian/ Protestant **8%**	
		Humanities **4%**			Christian/ Catholic **14%**	
		Natural Sciences **23%**			Christian/ Evangelical **7%**	
		Social Sciences **9%**			Christian/ Non-Denom. **31%**	
		Business **12%**			None **4%**	
		None **11%**			Other **13%**	

V. Procedure

The survey was created and disseminated via the online survey website, Qualtrics. Advisors from various student organizations at Pensacola State College asked members to participate on a voluntary basis. The Phi Theta Kappa Honor Society spearheaded this initiative. Several advisors also shared the Qualtrics survey link with students in their regular classes. Data

© 2016 Global Journals Inc. (US)

VI. Results

Collected data were exported from Qualtrics directly into the popular IBM Statistical Package for the Social Sciences (SPSS), which is a software package for statistical analysis. Once the correct measure was applied to the imported variables, a determination was made to use multiple models to analyze the resulting data. The results will be discussed in a structure consistent with the research questions. They measured different variables through both categorical and continuous data. To examine the first research question (RQ1), a chi-square analysis was performed. It explored whether a college student's knowledge of GMO productswould increase their likelihood of buying them. The findings revealed significant results: $x^2 (1) = 8.768$, $p < .01$ (Table 2).

Table 2: Chi-square Test

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	8.768[a]	1	.003		
Continuity Correction[b]	7.918	1	.005		
Likelihood Ratio	8.753	1	.003		
Fisher's Exact Test				.003	.002
Linear-by-Linear Association	8.728	1	.003		
N of Valid Cases	214				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 29.94. b. computed only for a 2x2 table

A crosstab analysis revealed 69% of respondents had prior knowledge of GMOs before taking the survey. Interestingly, 56% of participants admitted increased knowledge of GMOs would improve their likelihood of purchasing non-GMO products.

To analyze the second research question (RQ2), a simple regression analysis was performed. It tested whether the desire to eat healthier was enough to justify paying higher prices for non-GMO products. Data shown in Table 3 revealed the following results, supporting the regression model's significance: $F = 12.241$, $df = 1$, $p < .01$.

Table 3: Significance of Regression Model and Mean Square

ANOVA[a]						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	14.506	1	14.506	12.241	.001[b]
	Residual	257.147	217	1.185		
	Total	271.653	218			

a. Q7: Dependent Variable

b. Predictors: (Constant), Q6

The proportion of variance in the dependent variable (e.g., justifying paying higher prices for non-GMO products) is $R^2 = .053$ *or 5.3%*. The regression equation was formulated using unstandardized coefficients provided in the output (shown in Table 4): Q7 = 4.458 – (.266*Q6).

Table 4: Regression Model Output

Coefficients[a]								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	4.458	.303		14.712	.000	3.860	5.055
	Q6	-.266	.076	-.231	-3.499	.001	-.416	-.116

a. Q7 Dependent Variable

© 2016 Global Journals Inc. (US)

The third research question (RQ3) explored whether gender affects a college student's perception of GMOs. It was analyzed using a t-test. The means were: 2.45 for men and 2.39 for women (Table 5). The Levene's Test for Equality of variances indicated "Equal variances assumed." The end result was not significant: *t = .413, df = 212, p = .68; p/2 = .34>.05* (Table 6).

Therefore, gender had no effect on students' perceptions of GMOs. Further examination of data revealed 35% of the respondents elected to take a neutral stance, while 51% disagreed completely. Only 13% stated they believed gender had an impacting difference on college students' perceptions of GMOs.

Table 5: Group Statistics

	Gender:	N	Mean	Std. Deviation	Std. Error Mean
Q16	Male	96	2.45	.993	.101
	Female	118	2.39	1.046	.096

Table 6: Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Q16	Equal variances assumed	.105	.746	.413	212	.680	.058	.141	-.219	.335
	Equal variances n/assumed			.415	206.972	.678	.058	.140	-.218	.334

VII. Discussion

Results from the study indicated respondents from Pensacola State College believed having knowledge of non-GMO products would increase their likelihood of buying them (RQ1). Through expectancy theory, Vroom (1964) argued the anticipated result is not the "sole" determining factor in the way a person behaves. It is up to the individual to determine whether or not that specific expectation will be fulfilled (Stankovic, 2013). Since there was not a 100% favorable response rate in relation to the likelihood of purchasing non-GMO products in RQ1, it is yet another indicator that our individual perceptions can be impacted by other factors instead of the "desire" to do something.

Vroom's (1964) theoretical assumption was also addressed through specific survey questions that dealt with product labeling. A resounding 57% attested non-GMO product packaging led to the fulfillment of their expectation making a non-GMO purchase. In reference to public knowledge about the dangers of GMOs, 91% agreed food manufacturers should take a proactive approach by labeling their products (e.g., either GMO or non-GMO). However, the expectation and the implementation of such labeling are "two" separate things. This is because all too often, the intentions of regulators are overshadowed by those who remain skeptical about manufacturers of GM foods on grocery store shelves (Renko et al., 2003).

Meanwhile, findings from RQ2 indicate a college student's desire to eat healthy would be enough to justify paying higher prices for non-GMO products. When asked if they earned enough money to buy non-GMO products, 42% conveyed a neutral stance, while 22% admitted they made enough to make such purchases. The majority of respondents (52%) earned less than 25,000 annually. In terms of purchasing power, this revelation shed light on who could possibly be buying non-GMO foods in households. As Vroom (1964) contended, desire can be expressed through conversations or other means … and later translated into expectancy. However, financial obstacles can also pose problems. This situation lends credence to the idea that for these college students… parents, spouses, friends, or others could be helping them in their quest to avoid GMOs. The survey also addressed additional factors regarding food choices. Although many (35%) admitted reading product packaging before making grocery store purchases, 36% revealed the thought rarely crossed their minds. In relation to fast food

© 2016 Global Journals Inc. (US)

restaurants, 73% agreed consumers should know whether their items contain GMOs. Upscale restaurants were not excluded, as a majority of respondents (74%) also felt they should do the same.

In relation to motivation and time, it was interesting to read how respondents made food choices. Of the 214 participants, 131 agreed they normally ate fast food while in a hurry, compared to 165 who attested they preferred making their own meals at home. Interestingly, only 2% shopped primarily at whole foods/organic markets, while the majority (60%) frequented regular grocery stores (e.g., Food Lion or Publix). Although the desire to eat healthy may have resonated in the minds of many, the final decision was not always non-GMO. On average, 50% admitted eating at fast food restaurants at least once per week.

Results indicated RQ3 was not supported, meaning respondents did not think gender affected a college student's perception of GMOs. Of the 214 respondents, there were 96 males and 118 females. While 51% disagreed, 35% took a neutral stance. Of this sample, 78% were single, while only 16% were married. The fact that there were so few married participants was intriguing. Pensacola, Fla., is a huge military city, with both Air Force and Naval bases. It would have been interesting to see how a larger sample for this pilot study could have changed the scope of these specific differences.

Research questions aside, the last item on the GMO survey (Q35) addressed whether respondents "really" read the paragraph that described the nature of GMOs. A whopping 78% maintained they did, while 22% admitted they skipped it entirely. From an ethical standpoint, this question was added for sheer curiosity. It was also included to help gauge survey trends, specifically regarding content and estimated completion times. Going forward, it can help this researcher gauge how such descriptive elements can be integrated successfully in both electronic and hard-copy mediums.

a) Limitations and Proposal for Larger Study

Although this pilot study focused on GMOs and perceptions at one school, it would be beneficial to take this research one step further. With time constraints, lack of funding, and the reliance on one college, this researcher was aware of bias that could have been perceived. The study was limited to college students, many of whom were in their first (40%) or second year (39%). From a cultural perspective, 77% of respondents were Caucasian. It would have been nice to obtain a more "diverse mix" of participants. African American, Asian, and Hispanic American students each comprised 6%. At 31%, Christians (non-denominational) exemplified the highest level of participation. However, there were no respondents from Islamic, Hindu, or Jewish faiths.

VIII. Expanded Study

A larger study would entail addressing the impact of GMOs across generations, dealing specifically with Baby Boomers, Generation X, and Generation Y. Through a series of correlation analyses conducted among specific age groups, the intent would be determine whether age and gender have a significant impact on a person's likelihood of purchasing non-GMO products. The survey would be administered electronically through a network of colleges and universities across America, both public and private. College faculty and administrators would also be prospective respondents. In this refined study, Mannheim's (1927) Theory of Generations would be used. It suggests generations change swiftly in response to major events (DeChance, 2014). This theory can be summarized by the idea that "people resemble their times more than they resemble those of their parents" (McCrindle, 2007, p. 4). In reference to non-GMO products, it would be interesting to see if it held true for this expanded study.

VIII. Summary

Results from this study showed that even prior to survey completion, students at Pensacola State College had a relatively good knowledge of GMOs. They also felt this information would increase their likelihood of buying non-GMO products. In terms of cost, the majority agreed they would purchase non-GMO products if prices were lower. Additionally, most respondents disagreed when asked whether gender affected their perception of GMOs.

References Références Referencias

1. Al-Rabaani, A., & Al-Shuali, A. (2014). Sultan Qaboos University students' knowledge and attitudes regarding organic and genetically modified food products. *International Journal of Social Science & Education*, *5*(1), 28-37.
2. Batrinou, A. M., Spiliotis, V., & Sakellaris, G. (2008). Acceptability of genetically modified maize by young people. *British Food Journal*, *110*(3), 250-259.
3. Boundless. (2014, November 24). *Expectancy theory*: *Boundless management*. Retrieved from https://www.boundless.com/management/textbooks/boundless-management-textbook/organizational-behavior-5/process-and-motivation-47/expectancy-theory-242 3951/
4. DeChance, D. J, (2014). How to explain the millennial generation? Understand the context. *Student Pulse*. Retrieved from http://www. student pulse. com/a?id=878
5. Finkle, M. S., & Kim, H. (2003). Attitudes about genetically modified foods among Korean and American college students. *The Journal of Agrobio technology Management & Economics*, *6*(4), 191-197.

© 2016 Global Journals Inc. (US)

6. Fromartz, S. (2006). *Organic, Inc.: Natural foods and how they grow*. New York: Harcourt Trade Publishers.
7. Fu, F. Q. (2009). Effects of salesperson experience, age, and goal setting on new product performance trajectory: A growth curve modeling approach. *Journal of Marketing Theory and Practice*, *17*(1), 7-20.
8. Geib, A. (2012). GMO alert. *Natural News*. Retrieved from http://www.naturalnews.com/035734_GMOs _foods_dangers.html#
9. Goktolga, Z. G., & Esengun, K. (2009), Determining the factors affecting the consumers' willingness to pay higher prices for genetically unmodified products: Tomato case study in Turkey. *British Food Journal*, *111*(11), 1188-1199.
10. Harris, L. C., & Reynolds, K. L. (2003). The consequences of dysfunctional customer behavior. *Journal of Service Research*, *6*(2), 144-161.
11. Hemamalini, P. H., & Washington, A. (2014). Employees' motivation and valued rewards as a key to effective QWL from the perspective of expectancy theory. *TSM Business Review*, *2*(2), 45-54.
12. Hughner, R. S., McDonagh, P., Prothero, A., Shultz II, C. J., & Stanton, J. (2007). Who are organic food consumers? A compilation and review of why people purchase organic food. *Journal of Consumer Behavior*, *6*, 94-110.
13. Jagadeesan, P. (2011). Global consensus: Need of the hour for genetically modified organisms GMO labeling. *Journal of Commercial Biotechnology*, *17*(1), 37-44.
14. Knight, A. (2007). Intervening effects of knowledge, morality, trust, and benefits on support for animal and plant biotechnology applications. *Risk Analysis*, *27*(6), 1553-1563.
15. Lauk, C. M., Mosher, G. A., & Freeman, S. A. (2010). Factors affecting college students' knowledge and opinions of genetically modified foods. *Journal of Technology Studies*, *36*(2), 2-9.
16. Lim, H., & Dubinsky, A. J. (2004). Consumers' perceptions of e-shopping characteristics: An expectancy-value approach. *The Journal of Service Marketing*, *18.6*(7), 500-513.
17. Manheim, K. (1927). The problem of generations. In P. Kecskementi (Ed.), *Karl Manheim: Essays* (pp. 276-322). New York, NY: Routledge.
18. McCrindle, M. (2007). *Understanding generation y*. North Parramatta: Australian Leadership Foundation.
19. Miles, S., Ueland, O., & Frewer, L. J. (2005).Public attitudes towards genetically-modified food. *British Food Journal*, *104*(4/5), 246-262.
20. Non-GMO Project. (2015). *GMO facts: Frequently asked questions*. Retrieved from http://www.nogmo project .org/learn-more/
21. Peterson, B. (2011). The non-GMO labeling scam. *Farm Wars*. Retrieved from http://farmwars.info/
22. Renko, N., Brcic-Stipcevic, V., & Renko, S. (2003). Attitudes of the Croatian population toward genetically modified food. *British Food Journal*, *105*(3), 148-161.
23. Smith, J. (2008). Spilling the beans. *Organic Consumers Association*. Retrieved from https://www.organicconsumers.org/news/spilling-beans-unintended- gmo-health-risks
24. Squire, M. (2015). The non-GMO project verified seal. Non-GMO Project. Retrieved from http://www.nongmoproject.org
25. Stankovic, I. (2013). Organizational behavior of employees in the manufacturing environment: An engineering perspective. *International Journal of Organizational Innovation* *6*(2),49-53.
26. Van Dijk, E., Van Kleef, E. Owen, H., & Frewer, L. J. (2012). Consumer preferences regarding food-related risk-benefit messages. *British Food Journal*, *114*(3), 387-400.
27. Vroom, V. H. (1964). *Work and motivation*. New York, NY: McGraw-Hill.
28. World Health Organization.(2013). *Antimicrobial resistance. Fact sheet no. 194*. Retrieved from http://www.who.int/mediacentre/factsheets/fs194/en /index.html
29. Zhu, Z., Nakata, C., Sivakumar, K., & Grewal. D. (2013). Fix it or leave it? Customer recovery from self-service technology failures. *Journal of Retailing*, *89*(1), 15-29.

Appendix A

Electronic Survey: Genetically Modified Organisms: A College Student's Perspective

Thank you in advance for your participation!

Online Survey: Health concerns have prompted many consumers to take a closer look at the food items they purchase. However, a desire to eat healthier does not always translate into buying products that are better for us. Numerous factors often come into play. Therefore, the focus of this survey is to better understand the choices college students make when buying food, specifically those items which contain Genetically Modified Organisms (GMOs). Please answer each item as honestly as you can. All answers are anonymous, and results will be used strictly for academic purposes.

Consent: I understand my participation in this study should take approximately 10 minutes. I know that I may refuse to answer any question asked, and that I may discontinue participation at any time. I am aware that I must be at least 18 years of age to participate. My completion of the survey signifies my voluntary participation in this project.

© 2016 Global Journals Inc. (US)

What are GMOs? The following information was obtained from the Non-GMO Project: http://www.nongmoproject.org/learn-more/

GMOs are living organisms whose genetic material has been artificially manipulated in a laboratory through genetic engineering, or GE. This relatively new science creates unstable combinations of plant, animal, bacterial and viral genes that do not occur in nature or through traditional crossbreeding methods. Virtually all commercial GMOs are engineered to withstand direct application of herbicide and/or to produce an insecticide. Despite biotech industry promises, none of the GMO traits currently on the market offer increased yield, drought tolerance, enhanced nutrition, or any other consumer benefit. Meanwhile, a growing body of evidence connects GMOs with health problems, environmental damage and violation of farmers' and consumers' rights. Most developed nations do not consider GMOs to be safe. In the U.S., the government has approved GMOs, based on studies conducted by the same corporations that created them and profit from their sale. Increasingly, Americans are taking matters into their own hands and choosing to opt out of the GMO experiment. Unfortunately, even though polls consistently show that a significant majority of Americans want to know if the food they're purchasing contains GMOs, the powerful biotech lobby has succeeded in keeping this information from the public.

Q1. Prior to your participation in this survey, did you have any knowledge of GMOs?

- ❍ Yes
- ❍ No

Q2. Even if you knew information about GMOs beforehand, would this knowledge increase your likelihood of purchasing non-GMO products?

- ❍ Yes
- ❍ No

Q3. Have you ever given much consideration to product labeling?

- ❍ Yes
- ❍ No

Q4. Have you ever seen non-GMO labeling on food packaging?

- ❍ Yes
- ❍ No

Q5. Do you think food manufacturers should include non-GMO labeling on packaging?

- ❍ Yes
- ❍ No

Q6. Choosing healthy foods for consumption is of major importance to me.

- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neutral
- ❍ Agree
- ❍ Strongly Agree

Q7. Although I know healthy choices are smart, I have a hard time justifying paying higher prices for non-GMO products.

- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neutral
- ❍ Agree
- ❍ Strongly Agree

Q8. I would buy non-GMO products if the prices were lower than GMO products.

- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neutral
- ❍ Agree
- ❍ Strongly Agree

© 2016 Global Journals Inc. (US)

Q9. I do not make enough money to buy non-GMO products.

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

Q10. Buying non-GMO products is of no importance to me.

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

Q11. I do not read product packaging, even when the items I choose appear to be healthy.

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

Q12. I always look for non-GMO product labeling on items I buy from the grocery store.

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

Q13. I never think about asking if my fast food choices contain GMOs.

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

Q14. I think fast food chains should let consumers know if their products contain GMOs.

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

Q15. I think all restaurants should let consumers know if the items they serve contain GMOs.

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

Q16. I think gender affects a college student's perception of GMOs.

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

© 2016 Global Journals Inc. (US)

Q17. For the following questions, please select the option that best suits you.

	School Cafeteria	Fast Food Restaurant	Upscale Restaurant	Prepare Food on Your Own	Other
When you are hungry, with no time constraints, where do you normally eat?	❍	❍	❍	❍	❍
When you are in a hurry, where do you normally get food?	❍	❍	❍	❍	❍
In your opinion, what is the best option for acquiring food?	❍	❍	❍	❍	❍

Q18. How many times per week, on average, do you shop at the grocery store? _____

Q19. Is the grocery store you visit:

❍ A Whole Foods/Organic Market
❍ A Regular Grocery Store
❍ A Combination of Both
❍ Other

Q20. How many times per week, on average, do you buy meals from fast food restaurants?_____

Q21. How many times per week, on average, do you prepare your own meals?_____

Q22. What is your college classification (by year)?

❍ First Year
❍ Second Year
❍ Third Year
❍ Fourth Year
❍ Fifth Year or Beyond

Q23. What is your program of study?

❍ Undeclared
❍ Interdisciplinary Studies
❍ Education
❍ Christian Studies
❍ Fine Arts
❍ Humanities
❍ Natural Sciences
❍ Social Sciences
❍ Business
❍ None

Q24. The majority of your elementary and junior high education took place in what kind of educational environment?

❍ Public School
❍ Private School
❍ Home School

Q25. The majority of your high school education took place in what kind of educational environment?

❍ Public School
❍ Private School
❍ Home School

© 2016 Global Journals Inc. (US)

Q26. Gender:

- Male
- Female

Q27. Your primary religious affiliation is:

- Islamic
- Jewish
- Hindu
- Buddhist
- Christian-Mainline Protestant
- Christian-Catholic
- Christian-Evangelical
- Christian-Non-Denominational
- None
- Other

Q28. Politically, you are:

- Conservative
- Moderate
- Liberal

Q29. What is your marital status?

- Single
- Married
- Widowed
- Divorced/Separated

Q30. Your cultural background is mostly:

- Caucasian
- Asian-American
- Black/African American
- Hispanic American
- Other

Q31. What is your yearly financial income?

- Less than $25,000 annually
- $25,000 to $49,999 annually
- $50,000 to $74,999 annually
- $75,000 to $99,000 annually
- $100,000 or more annually
- Do not know/Prefer not to answer

Q32. What is your father's highest level of education?

- Some High School
- High School Diploma
- Some College
- College (Undergraduate) Degree
- Some Graduate/Professional (Master's, Doctoral, Medical, Law, etc.)
- Graduate/Professional Degree (Master's, Doctoral, Medical, Law, etc.)

Q33. What is your mother's highest level of education?

- Some High School
- High School Diploma
- Some College
- College (Undergraduate) Degree
- Some Graduate/Professional (Master's Doctoral, Medical, Law, etc.)
- Graduate/Professional Degree (Master's, Doctoral, Medical, Law, etc.)

© 2016 Global Journals Inc. (US)

Q34. What is your approximate GPA?

- Under 1.9
- 2.0 to 2.4
- 2.5 to 2.9
- 3.0 to 3.4
- 3.5 to 4.0

Q35. Did you honestly read the paragraph at the beginning of the survey that addressed GMOs and what they are?

- Yes
- No

Thank you for taking the survey!

© 2016 Global Journals Inc. (US)