2014

COLLEGE STUDENTS PERCEPTIONS OF ENVIRONMENTALLY CONSCIOUS EATING BEHAVIORS: A FORMATIVE EVALUATION

Victorine Shores
University of Rhode Island, vshores@my.uri.edu

Recommended Citation

COLLEGE STUDENTS PERCEPTIONS OF ENVIRONMENTALLY CONSCIOUS

EATING BEHAVIORS: A FORMATIVE EVALUATION

BY

VICTORINE H. SHORES

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE

REQUIREMENTS FOR THE MASTER OF

SCIENCE OF NUTRITION AND FOOD SCIENCES

UNIVERSITY OF RHODE ISLAND

2014

MASTER OF SCIENCE

OF

VICTORINE HALY SHORES

APPROVED:

    Thesis Committee:

  Major Professor   Geoffrey Greene

                           Ingrid Lofgren

                           Becky Sartini

Nasser H. Zawia
DEAN OF THE GRADUATE SCHOOL

UNIVERSITY OF RHODE ISLAND
2014

ABSTRACT

Objective: This study was a formative evaluation of modules related to Green Eating. Perceptions of the motivational value of the modules were assessed.

Design: This study was a cross-sectional study using secondary data.

Participants: 224 college students.

Intervention: Participants completed one of three online modules. Participants established a goal for the module they viewed and determined their self-efficacy (SE) in meeting their goal.

Main Outcomes: Motivational value was assessed using the Instructional Materials Motivation Survey (IMMS); IMMS scores were compared between modules. Goal congruency (relationship to module topic) and SE were compared between modules.

Analysis: Differences in IMMS score and SE were compared between modules using Analysis of Variance. The proportion of IMMS scores ≥3.5 (defined as motivating) and the proportion of goals that were congruent to the module were compared using Chi-Square analysis. Differences between goal congruence and SE and differences in stage of change (SOC), IMMS score, and SE were assessed.

Results: Average IMMS total score was ≥3.5 for each module, with no difference in IMMS score between modules. The majority of participants had an IMMS score ≥3.5. The majority of goals were congruent to the module that was viewed and participants were moderately to mostly confident in meeting their goal.

Conclusion: The modules were motivating to participants and they were able to establish a goal that was congruent to the module that they viewed.

Key Words: formative evaluation, green eating, IMMS, motivational value, self-efficacy.

ACKNOWLEDGMENTS

PREFACE

This thesis has been prepared in a manuscript format for the *Journal of Nutrition and Education and Behavior*. Manuscript format follows the journal's manuscript guidelines for authors. The manuscript may be submitted for publication.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

MANUSCRIPT

College Students Perceptions of Environmentally Conscious Eating Behaviors: A

Formative Evaluation

Victorine H. Shores[1]

Geoffrey W. Greene, PhD, RD, LDN[2]

For Submission to the Journal of Nutrition Education and Behavior

---

[1] Department of Nutrition and Food Sciences, 112 Ranger Hall, University of Rhode Island, Kingston RI 02881 (Vshores@my.uri.edu)
[2] Department of Nutrition and Food Sciences, 112 Ranger Hall, University of Rhode Island, Kingston RI 02881 (gwg@uri.edu) Corresponding author phone: 401-874-4028 fax 401-874-5974

INTRODUCTION

College students are in a developmental stage in life in which they are becoming more responsible for themselves and making independent decisions[1]. This can lead to unhealthful choices; in general, college students have a poor diet quality including low intake of fruits, vegetables[2] and fiber[3] as well as a high intake of high-fat fried foods[4]. Poor diet quality in young adulthood can persist leading to increased risk for chronic disease[3,5]. Web-based interventions have been shown to be an effective method of providing nutrition information to college students and are associated with significant dietary behavior changes, but dietary quality remained considerably below recommendations[6-10]. An innovative new approach is using "stealth" interventions which are designed to improve health related behaviors without appearing to be related to health[11]. For example, knowledge and attitudes about agricultural practices, food production and food distribution can influence individual dietary behaviors and food choices[12-14].

College students who consider "alternative food production practices (eating organic, local or from sustainable sources)" to be important have a better diet quality (including consuming more servings of fruits and vegetables, consuming more dietary fiber and having a lower percent of calories from fat) compared to students who consider alternative food production practices to be of low importance [15]. A study with college students enrolled in classroom-based course about food-related social issues increased fruit and vegetable consumption and decreased consumption of high-fat meat, high-fat dairy and processed foods[16]. However, to the authors' knowledge, no

2

study has used a web-based intervention with college students to increase motivation to become more sustainable eaters.

In addition to potentially improving diet quality, studies have suggested that adapting more sustainable eating behaviors can reduce the environmental impact of the food system[17,18]. Sustainable eating behaviors contribute to food and nutrition security and a healthy life for the present and future generations[18-20]. They are nutritionally adequate, safe and healthy; while optimizing natural and human resources[18-20]. Although general knowledge about the food system is important, specific dietary behaviors also related to sustainability need to be addressed. One behavior is eating locally produced food which is associated with a reduction in greenhouse gas (GHG) emissions[21], improved local economies[22] and improved food security within communities[23]. Another method to improve food system sustainability is to reduce edible food waste. Food waste represents a loss of energy invested into the production, transport and storage of food[24] as well as a loss of nutrition that could have been provided to one of the 17.6 million people in the United States suffering from food insecurity[25]. Additional areas of sustainable eating behavior such as increasing plant-based dietary choices[17] and choosing foods produced by sustainable farming methods[20], are beyond the scope of this study thus will not be reviewed. This study will focus on the foods system, eating locally produced foods and reducing food waste.

Researchers at the University of Rhode Island (URI) are developing a series of web-based modules designed to motivate college students to increase sustainable "green" eating (GE) behavior[26]. These modules are based on the ARCS curriculum

development motivational model which indicates that in order for motivation to be established and sustained, attention must be obtained and preserved throughout the lesson, relevance to learners' goals and needs must be made obvious, learners must feel confident in their ability to succeed in learning, and learners should feel satisfied about what they accomplished in the learning opportunity [27]. The Instructional Materials Motivation Survey (IMMS) is a validated survey that can be used to assess the motivational features of instructional materials based on the ARCS dimensions [28]. It is designed to measure the learner's reactions and motivational attitudes to instructional materials[28].

In order to improve the GE modules, it is important to assess the students' view of the acceptability and motivational value of the modules. Formative evaluation is a research methodology that has been used for these assessments[29]. The purpose of this study is to complete a formative evaluation of the modules in order to improve them for a future intervention.

METHODOLOGY

Overview

This project was a formative evaluation using data collected from an ongoing study, approved by the URI Institutional Review Board. Participants completed one of three online modules, (Introduction to Green Eating, Eating Local, or Waste-less Eating), and an evaluation of the module they viewed for class credit.

Participants

Students above the age 18 that were enrolled in participating courses were recruited as volunteers for this study and were granted extra credit in their course for study completion. Students chose whether to allow their data to be used for research, but received extra credit in their class regardless of their consent. Data reported in this study are from consenting participants only. Data for this study also restricted the sample to students between the ages of 18 through 24 to be consistent with previous research[30].

Tasks Completed By The Participants

Participants completed demographic questions and a behavior quiz before viewing the module. After viewing the module, participants completed the knowledge assessment, the IMMS[31], established a goal and completed additional evaluation items. Figure 1 displays the order of the GE module tasks completed by the participants. Detailed information on the content of the modules is presented in Table 1.

Instruments

Participants selecting, "I choose not to answer", for any of the items on an instrument used in this study were excluded from analysis of that instrument.

IMMS. Motivational value of the modules was assessed using the IMMS. The IMMS included 36 items which were answered on a five-point Likert scale with answers ranging from "not true" to "very true" with an option "I choose not to answer"[28]. The IMMS consists of four subscales; twelve items to measure Attention, nine items to measure Relevance, nine items to measure Confidence, six items to measure Satisfaction[28]. The IMMS was scored to assess individual subscale scores and

averaged to find a total score[28]. The scores were averaged for each subscale score as well as the average total score. Higher scores indicate the material was motivating[28]. IMMS scores were compared to a benchmark of ≥3.5, representing "moderately-mostly true"; this is consistent with previous research[30].

Additional Evaluation Items- Self Efficacy (SE) And Goal Congruence. Seven additional evaluation questions[30] were answered by the participants. The first three questions used a 5-point Likert type response options. There questions including, "Rate the degree to which the module motivated you to change", "What was your overall opinion of the module?", and "How likely would you be to recommend the module to a friend?" Responses ranged from "not at all" or "not good at all" to "very much" or "excellent". Goals were assessed by the open-ended item, "What is a goal you can make associated with the module you viewed?" Goals were self-established. Responses were coded then assessed as being congruent or incongruent to the module that was viewed. Following the goal, self-efficacy (SE) at meeting this goal was assessed: "How confident are you at meeting this goal?" Responses were anchored on a five-point Likert scale from, "not at all" to "very much". The final questions were open-ended: "What did you find really helpful/useful in this module?" and "What would you change to better reach college students?" The answers to the three open-ended items were coded to find common themes for descriptive purposes.

Behavior Quiz. The behavior quiz was included at the start of each module. The behavior quiz for the Introduction to GE module and the Eating Local module included five questions and the behavior quiz for the Waste-less module included four questions. These questions were used to look at the behaviors practiced by the

participants related to the module that they viewed. An example of a behavior questions from each module was "How often do you consider the environmental impact when making food choices?" (Introduction to GE module); "When you purchase food, where do you go most frequently?" (Eating Local module); "When you go up to the serving line at the dining hall do you…" (Waste-less module). Answers to these the questions were scored from low to high in terms of their environmental friendliness. These scores were used to provide participants with feedback about the GE behaviors prior to viewing the module.

Knowledge Assessment. Questions on the knowledge assessment were based on the information that was provided in the module. Each question was scored as correct or incorrect. The Introduction to GE module and the Eating Local module knowledge assessment had five questions and the Waste-less module had four questions. Participants who answered more than one question incorrectly on the knowledge assessment scored low and those missing no more than one question scored high on the knowledge assessment.

Demographic Data. Demographic data were collected including: age, gender, race, year in school, major, and Stage of Change (SOC) for GE[32]. For data analysis, race was coded as "white" or "other", (black or African American, Hispanic/ Latino, Asian, Native Hawaiian or Other Pacific Islander, American Indian or Alaska Native, mixed race or other race). Major was recoded to health or science field (1) or other (2). For those who said they had two majors, the first major that was listed was chosen for analysis. SOC was classified as either pre-action (pre-contemplation, contemplation and preparation) or post-action (action and maintenance).

Hypothesis

Hypothesis 1: There will be no difference between modules in the proportion of students finding them motivating (defined by IMMS total score ≥3.5).

Hypothesis 2: There will be no difference in in total IMMS score between the modules.

Secondary 1: Most goals, (≥75%), will be congruent to the module that was viewed.

Secondary 2: There will be no difference in IMMS total score or subscale score between modules.

Secondary 3: There will be no difference in total IMMS score after adjusting for gender.

Exploratory 1: Participants who establish a goal that is congruent to the module that was viewed will have higher SE in meeting their goal than students who establish a goal that is not congruent with the module.

Exploratory 2: Participants who are in a post-action SOC will have a higher IMMS total score and higher SE in meeting their goal than those in a pre-action SOC.

Analysis

Statistical analyses were conducted using IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY. Normality of the continuous variables was assessed and all were normally distributed. Descriptive data were presented as a mean ± standard deviation and categorical data was assessed as frequency and percent.

Categorical data were assessed using Chi-Square analysis. This was done to determine the proportion of IMMS total scores for each module that were categorized as motivating (≥ 3.5) and not motivating (<3.5). Chi-Square analysis were also used to

assess the proportion of goals that were congruent and not congruent between modules.

Continuous data were assessed using Analysis of Variance. This was done to assess differences in IMMS total scores and subscale score between the modules. Significant univariate results were followed up by Tukey-Post Hoc tests. To control for potential effect of gender on IMMS scores, Analysis of Covariance was used.

An Independent T-test was used to determine the relationship between goal congruence (yes/no) and participant's confidence at meeting their goal. Additionally, two Independent T-tests were used to determine the relationship between SOC and IMMS score and SE.

Significance was set at a p-value of .05.

RESULTS

Participants

Demographic data are presented in Table 2. Participants in this study were a convenience sample of students (n=345) from three classes in a Northeastern university; 224 participated. The mean age of the participants was 19.2 ± 1.3 years. The majority of the participants were female (77.1%). More than half the participants were freshmen (58.9%) and the majority of the sample reported their race as "white" (88%). More than half of participants (56.6%) were majoring in a field related to health or science. Descriptive analysis of participants revealed that most participants (81.4%) were in a pre-action SOC for GE.

IMMS Score

Differences in IMMS subscale score and total score between the modules is presented in Table 3. Ninety-eight participants (57%) had an IMMS total score greater than or equal to 3.5. As indicated by a Chi-Square analysis, there was no difference in this proportion between modules ($\chi^{2=}2.2_{[df=2]'}$ p=.34). The average total IMMS score was $3.6 \pm .5$. There was no difference in IMMS total score by Analysis of Variance between the modules (F $_{[df=2,181]}$ = 1.29, p=.27). In subsequent univariate analyses of IMMS subscale scores, there was a significant difference in Relevance subscale (F $_{[df= 2, 192]}$ = 3.4, p= .03), Tukey-Post Hoc analysis demonstrated the Waste-less module had a significantly higher score than the other modules (p=.038). Analysis of Covariance determined there was no difference in IMMS total score by gender (F $_{[df= 3]}$= 1.6, p=.18). Independent T-tests determined participants in post-action SOC had a significantly higher IMMS score (t $_{[df=182]}$ = -2.36, p=.02) than participants in a pre-action SOC.

Goal Congruence And Self-Efficacy For Goal Attainment

Data on goal congruency and SE are presented in Table 4. Most goals established by the participants were congruent to the module that was viewed (77.2%). There was no significant difference in goal congruence by module ($\chi^2_{[df= 4]}$ = 3.16, p= .53). The Eating Local module had the highest percent (92%) of goals that were congruent to the module and the Waste-less module had the lowest percent (69.5%) of goals that were congruent to the module. SE for attaining the goal was compared using an Analysis of Variance. The average SE score of all modules was 3.5 ± 1.0 on a five point scale. There was an effect of module on SE (F $_{[df=2]}$ = 4.99, p=.01). Tukey-Post

Hoc analyses revealed participants viewing the Waste-less module had a higher SE score than the other modules. Independent T-tests determined there was no significant difference in the SE of participants establishing a goal that was congruent or incongruent to the module (t $_{[df=190]}$= -.50, p= .62). Independent T-tests determined participants in a post-action SOC had significantly higher SE in their ability to meet their goal (t $_{[df=192]}$ = -2.0, p=.045) than those in a pre-action SOC.

Behavior Quiz And Knowledge Assessment

Data on the behavior and knowledge scores are presented in Table 5. Overall, the majority of participants (53.6%) scored in the medium range for environmentally friendly behavior practices. Eating Local had the greatest amount of participants in the highest environmentally friendly behavior category (37.9%) and the Waste-less module had the highest amount of participants receiving low environmentally friendly behavior scores (21.4%). Overall, 72% of the participants missed no more than one question, therefore, scored high on the knowledge assessment. There was no significant difference in participants scoring high on the knowledge assessment between modules (χ^2 $_{[df=2]}$= 2.9, p=.23).

Additional Evaluation Items:

Data on the additional evaluation items are presented in in Table 6. Overall, the average score for the ability of the module to motivate change was 2.7 ± .8, indicating most participants perceived the modules as being slightly to moderately effective at motivating change. There was a difference between modules in motivating change (F $_{[df=2]}$ =4.38, p=.034). Participants who viewed the Waste-less module rated

it significantly higher in motivation to change than the Introduction to GE module as determined by a Tukey-Post Hoc (p=.029) and there was no difference in the Eating Local module. There was no difference in module as rated by participant's opinions (the average opinion rating was satisfactory to good at $3.8 \pm .8$) or likelihood in recommending the module to a friend (the average score was 2.9 ± 1.1 indicating most participants were slightly to moderately likely to recommend the module).

Open Ended Questions- Feedback about the Modules:

Two hundred and one participants responded to the open ended question, "*what did you find really helpful/useful in this module?*" The most frequent responses were: *facts and information presented in the module* (n=49), *videos within the module* (n=30), *images, pictures and visuals aids used in the module* (n=29), *hands on information and interactive* (n=15), *the explanation of GE* (n=15) and *statistics presented in the module* (n=12). Example of some of the quotes stated by a participant included, "I really liked the pictures and videos that were included throughout this module. They really helped to make learning the material a little more interactive than just reading" and "The amount of facts that were in the module helped to keep my attention and I enjoyed learning about a topic I did not know much about."

Two hundred participants responded to the open ended question, "*what would you change (about the module) to better reach college students?*" Answers most frequently provided by the participants included: *relate the modules more toward college life or the college-age individual* (n=36), *make the modules shorter* (n=18), *make the modules more interactive* (n=12), *add more videos to the modules* (n=11), *provide more examples of the cons of not eating green* (n=10) *and make it more*

interesting (n=10). Examples of some of the quotes stated by the participants included, "Honestly, to better reach college students it may be best to show more negative effects of not eating green" and "adding pictures of other young people".

DISCUSSION

The purpose of this study was to conduct a formative evaluation of three GE modules to assess if the modules were motivating to college students. Results from this study showed the GE modules were moderately motivating to participants. Additionally, most of the participants established goals that were congruent to the module that was viewed and were moderately to mostly confident in their ability to attain their goal. However, as expected from formative evaluations, this study found areas to improve in future interventions.

The majority of participants found the GE modules to be motivational as indicated by 57% of participants scoring the total IMMS score ≥3.5. This was consistent with another study using the IMMS to assess motivation of a web-based health promotion intervention with college students[30], and higher than another study using IMMS to assess motivational difference in two web-based courses related to asthma and depression[33]. Unlike other studies[30,33], there was no difference in IMMS total score between males and females, suggesting the GE modules were equally motivational to both gender groups.

There was no difference in IMMS total score between the modules assessed continuously and categorically, but there was a significant difference in the continuous

subscale score between modules for Relevance. Relevance was higher in the Waste-less module than the Introduction to GE module. Keller recommended that in order for students to be motivated to learn, they must first believe the content is related to their personal goals or motives[34]. Successful instruction is able to close the gap between the subject matter and the learners needs, wants and desires[34]. It is possible that the participants found the Waste-less module more relevant to their lives based on the information that was provided. The Waste-less module included statistics on food waste from university dining halls, related the environmental impact of food waste to current events (such as the BP oil spill), and related the amount of food waste in the United States (US) to local landmarks that students might be familiar with (such as Gillette Stadium). This is different from the Introduction to GE module which provided definitions for various GE terminologies without relating GE to a university setting, current events, or local places. The Eating Local module was not different than the other modules, perhaps because is provided both general and specific information. For example, the Eating Local module provided the participants a list of places to eat locally in Rhode Island. There was also a specific behavioral objective of the Waste-less module (to decrease edible food waste) and the Eating Local module (to increase local food consumption) compared to the more general objective of the Introduction to GE module (to increase awareness of GE). Because the Relevance score was the lowest for the Introduction to GE module and 46% of participants that viewed the Introduction to GE module had an IMMS total score <3.5, it could be suggested that the content of this module did not meet the participant's needs, wants and desires. It is possible that incorporating specific behavioral objectives into the Waste-less and

Eating Local modules made the modules more relevant to participant's lives. Results indicate that The Introduction to GE module should include more information related to a university setting, current events, and a behavioral objective related to GE.

The satisfaction subscale of the IMMS for all three modules was lower than the other subscale which is consistent with other studies using IMMS[30,33]. Keller suggested using praise and motivational feedback as a technique to improve learner's satisfaction[34]. After participants completed the knowledge assessment, they were informed of what their score was but not what their score meant. Satisfaction could have been higher if participants received positive feedback for answering the knowledge assessment questions correctly or were given motivational feedback and information for where they could learn about the questions they missed. The Eating Local module had the lowest satisfaction score as well as the lowest percent of participants receiving high scores on the knowledge assessment. It is possible that the participants viewing the Eating Local module were less satisfied in the learning opportunity because it did not prepare them for the knowledge assessment.

The majority of participants established a goal that was congruent to the module that was viewed and were moderately to mostly confident in their ability to meet their goal. The Eating Local module had the highest percent of participants that set a goal that was congruent to the module that was viewed. Possible explanations for this could be that the module contained specific information to inform participants how to eat locally in Rhode Island, including where to purchase local food and how to eat seasonally. This could have made it easier for the participants to set a goal related to eating locally. However, participants viewing the Eating Local module rated their

SE for goal attainment lower than the other modules. This suggests that participants viewing the Eating Local module may be less likely to meet their goal than participants viewing the other modules. A low SE score could also indicate that participants viewing the Eating Local module were not provided enough resources to help them reach their goal. Forty percent of participants viewing the Eating Local module were freshmen, therefore, it is likely that the majority of their meals were consumed in university dining halls that do not label food as being local. The barrier of lack of access to local food could have made participants establishing a goal related to eating locally less confident in their ability meet their goal. Including information in the Eating Local module about how to eat locally on or near campus may improve participants SE at meeting their goal.

The participants in a post-action SOC had significantly higher IMMS total scores than those that were in a pre-action SOC. This could signify that the motivational value of the GE modules was perceived as higher for those in post-action SOC. The Transtheorectical Model (TTM) was designed to develop interventions that match the individuals specific needs and readiness to change, therefore participants in different stages may have varying needs and be motivated differently[35,36]. Future research could explore stage-tailoring the GE modules to assist in progression through the SOC, thus improving motivational value of the GE modules.

The majority of participants fell in the medium range for practicing GE behaviors related to the specific module that they viewed which is consistent with their being in a pre-action SOC for GE. It appears most participants were practicing some GE behaviors but did not meet the criterion for being in the action SOC for GE.

However, the behavior quiz items were not validated. Future studies that wish to explore more about participants GE behaviors should use validated items.

Overall, the majority of participants (72%) had one or less incorrect responses on the knowledge assessment. The Eating Local module had a lower proportion suggesting this assessment was more difficult than the other modules. For example, one of the questions was to define of the term "locavore", but the definition of locavore could only been seen if the participant placed his or her mouse over the term in the module. Additionally, the participant was asked to select the exact number of farmers markets that existed in the US in 2012. The answer to the question was included as a graph within the module; if the participant analyzed the graph only to assess the trend they may not have noticed the exact number included in the graph. Future research should modify the knowledge assessment to assess only the content from the module that is made clear to the student and use validated questions to assess knowledge acquired from the module.

Overall, the participants rated the modules as being slightly to moderately effective at motivating change, had a positive opinion of the module, and would recommend the module to a friend. The ability to motivate change was significantly higher for the Waste-less module compared to the Introduction to GE module. This is similar to IMMS results. This suggests the Introduction to GE module should be modified to increase its' motivational ability.

Limitations:

One of the limitations of this study was that there was an unequal distribution of participants that viewed each module. Additionally, most of the participants were

freshmen in college, thus were less likely to have control over their eating environment. Most freshmen purchase their meals from dining halls that do not label items as local. In addition, most participants were from health or science related majors and identified themselves as "white", therefore, results from this study may not be generalizable to those not in health or science related fields or in ethnically diverse populations. Finally, the SOC for GE, goal setting, and the single additional evaluation item related to motivational ability of the module are indirect measures of motivation. Future studies are needed to assess the influence of the GE modules on improving GE behaviors and diet quality. However, there are strengths to this study. To the authors knowledge, no study has been published using formative evaluations to assess motivational value of web-based modules related to GE with college students. Other strengths include the use of a validated assessment tool (IMMS) and the convenience of completing the modules and evaluation materials electronically from personal computers.

IMPLICATIONS FOR FUTURE RESEARCH AND PRACTICE

Results from this formative evaluation can be used to design curricula related to GE to better suit the college student population. In order to improve motivation for change, lesson content needs to be made relevant to the lives of college students and participants need to feel satisfied in the learning opportunity of the modules. Future interventions should explore relating GE to the university setting and incorporating current events, local places, and behavioral objectives to each of the GE modules to

improve relevance. Motivational feedback and praise should be incorporated with the knowledge assessment of the GE modules as a method to improve learner's satisfaction. Goal setting should continue as a method for motivating change. Future interventions should provide participants with specific information on how to attain their goal to improve their SE in meeting their goal. Future interventions should explore tailoring the GE modules by SOC. Web-based interventions related to increasing GE behaviors with college students are a new area of research. Future studies should continue to explore ways to improve effectiveness of program development in influencing behavior change. Finally, future research should assess diet quality with the GE modules to determine if the GE modules are affective at improving diet quality of the college students.

REFERENCES

1.   Arnett J. Emerging adulthood: A theory of development from the late teens through the twenties. *American Psychologist.* 2000;55(5):469-480.
2.   Reference Group Executive Summary, Fall 2011: Undergraduate Students Only. *American College Health Association National College Health Assessment Survey* 2011; http://www.acha-ncha.org/docs/ACHA-NCHA-II_UNDERGRAD_ReferenceGroup_ExecutiveSummary_Fall2011.pdf. Accessed September 22, 2013.
3.   Huang TT, Harris KJ, Lee RE, Nazir N, Born W, Kaur H. Assessing overweight, obesity, diet, and physical activity in college students. *Journal of American college health: J of ACH.* Sep-Oct 2003;52(2):83-86.
4.   Racette SB, Deusinger SS, Strube MJ, Highstein GR, Deusinger RH. Changes in weight and health behaviors from freshman through senior year of college. *Journal of nutrition education and behavior.* Jan-Feb 2008;40(1):39-42.
5.   Chronic Disease Indicators 2012; http://apps.nccd.cdc.gov/cdi/IndDefinition.aspx?IndicatorDefinitionID=9. Accessed April 11, 2014.
6.   USDA and US Department of Health and Human Services. Dietary Guidelines for Americans, 2010. 2010; 7th Accessed April 11, 2014.
7.   O'Donnell S, Greene G, Blissmer B. The effect of goal setting on fruit and vegetable consumption and physical activity level in a web- based intervention. *Journal of nutrition education and behavior.* (In Press).
8.   Milan J, White A. Impact of a stage-tailored, web-based intervention on folic acid-containing multivitamin use by college women. *American journal of health promotion : AJHP.* Jul-Aug 2010;24(6):388-395.
9.   Poddar KH, Hosig KW, Anderson ES, Nickols-Richardson SM, Duncan SE. Web-based nutrition education intervention improves self-efficacy and self-regulation related to increased dairy intake in college students. *J Am Diet Assoc.* 2010; 1723-1727. Available at: http://www.ncbi.nlm.nih.gov/pubmed/21034887. Accessed 11, 110.
10.   Greene GW, White AA, Hoerr SL, et al. Impact of an online healthful eating and physical activity program for college students. *American journal of health promotion : AJHP.* Nov-Dec 2012;27(2):e47-58.
11.   Robinson T. *Stealth Interventions for Obesity Prevention and Control: Motivating Behavior Change. In: Dube L, Bechara A, Dagher A, et al, eds. Obesity Prevention: The Role of Brain and Society on Individual Behavior* New York: Elsevier.
12.   McMichael AJ, Powles J, Butler C, Uauy R. Food, livestock production, energy, climate change, and health. *Lancet.* Oct 6 2007;370(9594):1253-1263.
13.   Dahm M, Samonte A, Shows A. Organic foods: do eco-friendly attitudes predict eco-friendly behaviors. *Journal of College Health.* 2009;58(3):195-202.

14.   Kornelis M, Herpen E, Lans I, et all. Using non-food information to identify food-choice segment membership. *Food Quality and Preference* 2010;21(5):512-520.

15.   Pelletier J, Laska M, Neumark-Sztainer D, Story M. Positive Attitudes Toward Organic, Local, and Sustainable Foods are Associated with Higher Dietary Quality Among Young Adults. *Journal of the Academy of Nutrition and Dietetics.* 2012;113(1).

16.   Hekler EB, Gardner CD, Robinson TN. Effects of a college course about food and society on students' eating behaviors. *American journal of preventive medicine.* May 2010;38(5):543-547.

17.   Carlsson-Kanyama A, Gonzalez AD. Potential contributions of food consumption patterns to climate change. *The American journal of clinical nutrition.* May 2009;89(5):1704S-1709S.

18.   Garnett T. Food sustainability: problems, perspectives and solutions. *The Proceedings of the Nutrition Society.* Feb 2013;72(1):29-39.

19.   Garnett T. Where are the best opportunities for reducing greenhouse gas emissions in the food system (including the food chain)? *Food Policy.* 2011;36:523-532.

20.   FAO. *Sustainable Diets and Biodiversity Directions and Solutions for policy, Research and Action* Rome 2010.

21.   Hall KD, Guo J, Dore M, Chow CC. The progressive increase of food waste in America and its environmental impact. *PloS one.* 2009;4(11):e7940.

22.   Martinez S, Hand M, Da Pra M, et al. Local food Systems, Concepts and Issues. 2010; http://purl.access.gpo.gov/GPO/LPS125302. Accessed July 17, 2013.

23.   Peters CJ, Bills NL, Wilkins JL, Fick GW. Foodshed analysis and its relevance to sustainability. *Renewable Agriculture and Food Systems.* 2008;24(1):1-7.

24.   Beretta C, Stoessel F, Baier U, Hellweg S. Quantifying food losses and the potential for reduction in Switzerland. *Waste management.* Mar 2013;33(3):764-773.

25.   Coleman-Jensen A, Nord M, Singh A. Household Food Security in the United States in 2012. USDA; 2012.

26.   Weller KE, Greene GW, Redding CA, et al. Development and Validation of Green Eating Behaviors, Stage of Change, Decisional Balance, and Self-efficacy Scales in College Students. *Journal of nutrition education and behavior.* (In Press).

27.   Keller J. Development and use of the ARCS model of instructional design *Journal of Instructional Development.* 1987;10(3):2-10.

28.   Keller JM. Motivational Design for Learning and Performance. New York Springer; 2010:277-286.

29.   Reiser R, Dempsey, J. *Trends and Issues in Instructional Design and Technology.* 3rd ed. Upper Sadle River, NJ: Pearson Education 2012.

30.   Dour CA, Horacek TM, Schembre SM, et al. Process Evaluation of Project WebHealth: a Nondieting Web-Based Intervention for Obesity Prevention in College Students. *Journal of nutrition education and behavior.*2013;45:288-295. Feb 11 2013.

31. JM K. Motivation and Instructional Design: A Theorectical Perspective *Journal of Instructional Development* 1979;2(4):26-34.

32. Eastman K, Greene G. The "Green Eating" Project: A Pilot Intervention to Promote Sustainable and Healthy Eating in College Students. 2012. http://digitalcommons.uri.edu/srhonorsprog/286/. Accessed April 27 2013.

33. Cook DA, Beckman TJ, Thomas KG, Thompson WG. Measuring motivational characteristics of courses: applying Keller's instructional materials motivation survey to a web-based course. *Academic medicine : journal of the Association of American Medical Colleges.* Nov 2009;84(11):1505-1509.

34. Keller JM. Strategies for Stimulating the Motivation to Learn. *Performance and Improvment.* 1987;26(8):1-7.

35. Prochaska JO. Decision making in the transtheoretical model of behavior change. *Medical decision making : an international journal of the Society for Medical Decision Making.* Nov-Dec 2008;28(6):845-849.

36. W.F. Velicer, J.O. Prochaska, J.L. Fava, G. J. Norman, Redding CA. Transtheorectical Model Detailed Overview of the Transtheoretical Model http://www.uri.edu/research/cprc/TTM/detailedoverview.htm. Accessed April 1 2014.

TABLES AND FIGURES

TABLE 1. DETAILED CONTENT OF THE GREEN EATING (GE) MODULES

	Introduction to GE	Eating Local	Waste-less
Topics Covered	What is GE; what are food systems; issues with unsustainable food systems; principles of GE.	What is eating local; why eat local; where to get local food; how to eat local year round.	What is food waste; why care about food waste; how can we waste less, composting.
Video Topics	Conventional agriculture; sustainable agriculture; fossil fuels.	Eating local; why eat local.	Big retail food waste.
Additional Learning Tools	GE calculator.	Definition of localvore; Rhode Island (RI) local food guide; farmers markets, community supported agriculture, food co-ops and health food store in RI; list of different produce produced in each season.	Statistics about food waste; web links provided with additional information on impact of tray-less dining in dining halls; food insecurity; composting.
Key Concepts	The difference between conventional and sustainable agriculture; benefits of sustainable agriculture on environment and future generations; information on how to eat Green.	Eating local is better for the environment and for the local economy; average distance food travels is 1500 miles.	Problems with food waste; how to waste less; what can you do.
Behavioral Objectives	Increase awareness of GE.	Increase local food consumption.	Decrease edible food waste.

TABLE1: DETAILED CONENT OF THE GREEN EATING (GE) MODULES, (CONTINUED)

	Introduction to GE	**Eating Local**	**Waste-less**
Behavior Quiz	Description of their diet and consideration of environmental impact when making food choices.	Purchasing food and knowledge or where food comes from.	How often they waste food, purchase items in bulk, use reusable items and their familiarity with composting.
Knowledge Assessment	Definitions for GE and sustainability, description of food system, percentage of fossil fuels needed for food production.	Benefits of eating local; miles food travels; farmers market growth.	Largest source of food waste and the amount of food wasted.

TABLE 2: DEMOGRAPHIC DATA OF PARTICIPANTS

	Introduction (n=167)	Eating Local (n=29)	Waste-less (n=28)	Total (n=224)
Age (n=224)	19.1 ± 1.2	19.8± 1.7	19.3 ± 1.3	19.2± 1.3
Gender (n=223)[1]				
Male	48 (28.9%)	3 (10.3%)	3 (10.7%)	54 (24.2%)
Female	118 (71.1%)	26 (89.7%)	28 (89.3%)	172 (77.1%)
Year in School (n= 224)				
Freshman	107 (64.1%)	11 (37.9%)	14 (50.0%)	132 (58.9%)
Other	60 (36.0%)	18 (62.1%)	14 (49.9%)	92 (40.9%)
Race (n=224)				
White	145 (86.8%)	28 (96.6%)	25 (89.3%)	198 (88.3%)
Other	22 (13.2%)	1 (3.4%)	3 (10.7%)	26 (11.6%)
Field of Study (n=224)				
Health or Science	106 (63.5%)	12 (41.1%)	10 (35.7%)	128 (56.6%)
Other	61 (36.5)	17 (58.9%)	18 (64.3)	96 (43.4%)
Stage of Change (n=212)[2,3]				
Pre-Action	132 (82.5%)	22 (84.6%)	19 (73.0%)	173 (81.6%)
Pre-contemplation	32 (20.0%)	3 (11.5%)	3 (11.5%)	38 (17.9%)
Contemplation	72 (45.0%)	12 (46.2%)	12 (46.2%)	96 (45.2%)
Preparation	28 (17.5%)	7 (26.9%)	4 (15.4%)	39 (18.3%)
Post-Action	28 (17.5%)	4 (15.3%)	7 (26.9%)	48 (22.6%)
Action	11 (6.9%)	1 (3.8%)	2 (7.7%)	23 (10.8%)
Maintenance	17 10.6%)	3 (11.5%)	5 (19.2%)	25 (11.7%)

[1] One participant selected, "I choose not to answer".

[2] 12 participants did not answer the SOC question

[3] Introduction to GE (n=160), Eating Local (n=26), Waste-less (n=26), Total (n=212)

TABLE 3. INSTRUCTIONAL MATERIALS MOTIVATION SURVEY (IMMS)
AVERAGE SUBSCALE SCORE AND TOTAL SCORE BY MODULE

	Introduction (n=138)	Eating Local (n=25)	Waste-less (n=21)	F ratio (df)	P Value
Attention[2]	$3.7 \pm .6$	$3.8 \pm .7$	$3.8 \pm .6$	.33 (2,190)	.71
Relevance[3]	$3.4 \pm .6^a$	$3.5 \pm .6^{ab}$	$3.8 \pm .7^b$	3.38* (2,192)	.03*
Confidence[4]	$4.0 \pm .6$	$3.9 \pm .5$	$4.1 \pm .7$	.71 (2, 191)	.49
Satisfaction[5]	$3.1 \pm .8$	$3.0 \pm .9$	3.3 ± 1.0	.52 (2,189)	.59
Total IMMS	$3.6 \pm .5$	$3.5 \pm .5$	$3.7 \pm .6$	1.29 (2,181)	.27
Number scoring ≥ 3.5[1]	69 (50%)	15 (60%)	14 (66%)		

[a,b] differing superscript letter denote significant difference between groups
*p <.05
[1] 98 participants (57%) received IMMS score ≥3.5 (χ^2=2.2 [df= 2], p=.34)
[2] Introduction to GE (n=145), Eating Local (n=26), Waste-less (n=22)
[3] Introduction to GE (n=148), Eating Local (n=26)
[4] Introduction to GE (n=147), Waste-less (n=22)
[5] Introduction to GE (n=144), Eating Local (n=26), Waste-less (n=22)

TABLE 4. GOAL CONGRUENCY AND SELF-EFFICACY BETWEEN MODULES

	Introduction (n=150)	Eating Local (n=25)	Waste-less (n=23)	Total (n=198)	X^2 (df)
Goal Congruent	114 (76%)	23 (92%)	16 (69.5%)	153 (77.2%)	3.16 (4), p=.53
Goal Incongruent	36 (24%)	2 (8%)	7 (30.4%)	45 (22.7%)	
Self-efficacy*[2] (mean ± SD)	$3.5^a \pm 1.0$	$3.5^a \pm 1.0$	$4.1^b \pm .8$	3.5 ± 1.0	F= 4.99 (2), p=.001

[a,b] Means with different superscript differ (Tukey p<.05)

*p =.008

[2] Introduction to GE (n=146), Eating Local (n=26), Waste-less (n=22), Total (n=194)

TABLE 5. COMPARISON OF BEHAVIOR AND KNOWLEDGE SCORE BY MODULE

	Introduction (n=167)	Eating Local (n=29)	Waste-less (n=28)	TOTAL
Behavior Quiz				
Low	29 (17.4%)	4 (13.8%)	6 (21.4%)	39 (17.4%)
Medium	97 (58.0%)	14 (48.3%)	15 (53.6%)	126 (56.3%)
High	41 (24.6%)	11 (37.9%)	7 (25.0%)	59 (26.3%)
Number (Percent) of Participants Scoring High (≤1 incorrect answers) on Knowledge Assessment*	123 (73.7%)	17 (58.6%)	21 (75.0%)	161 (71.9%)
*χ^2= 2.9 $_{(df=2)}$, p= 2.33				

TABLE 6. COMPARISON OF ADDITIONAL EVALUATION ITEMS BY MODULE

	Introduction (n=151) Mean ± SD	Eating Local (n=26) Mean ± SD	Waste-less (n=22) Mean ± SD	Average Score	F ratio (df)
Motivation to change (n=200)*	2.7 ± .8[a]	2.8 ± .9[ab]	3.1 ± .9[b]	2.7 ± .8	4.38 (2)
Opinion of module[1]	3.8 ± .8	3.5 ± .8	3.8 ± .8	3.8 ± .8	1.36 (2)
Recommend module to friend[2]	2.9 ± 1.1	2.6 ± 1.0	3.0 ± 1.3	2.9 ± 1.1	.981 (2)
*p= .034 [a,b] differing superscript letters denote significant difference between groups (p=.029) [1]Introduction to GE (n=149) [2]Introduction to GE (n=150)					

FIGURE 1: ORDER OF THE GREEN EATING MODULE TASKS COMPLETED
BY THE PARTICIPANTS

Demographics

↓

Behavior Quiz

↓

Viewed Module Content

↓

Knowledge Assessment

↓

IMMS/ Addition Evaluation Items

APPENDIX A

EXTENDED LITERATURE REVIEW

<u>Introduction</u>

Knowledge and attitudes of agricultural practices, food production and food distribution can influence individual dietary behaviors and food choices[1-3]. Young adults are in a developmental stage of life when they are becoming responsible for themselves and making more independent decisions[4] such as making their own dietary choices. Studies have shown that college students, ages 18-24, have poor diet quality including: low intake of fruits, vegetables[5] and fiber[6] as well as a high intake of high-fat fried foods[7]. However, college students who consider sustainable eating practices, such as eating organic, local or from sustainable sources to be important have a higher diet quality (including consuming more servings of fruits and vegetables, consuming more dietary fiber and having a lower percent of calories coming from dietary fat) compared to students who consider those to be of low importance[8].

Web-based interventions can be an effective method of providing nutrition information to college students and are associated with dietary behavior changes[9-12]. However, few studies have investigated the use of web-based interventions as a method of educating college students about sustainable eating behaviors, known as "Green Eating" (GE). Researchers at the University of Rhode Island (URI) have developed a series of web-based modules to promote and educate college students on how to become "Green Eaters". In order to improve the intervention, it is important to assess the students' view of the acceptability and motivational value of the modules.

31

Formative evaluation is a research methodology that has been used for these types of assessments[13].

This extended literature review will provide the justification for the web-based GE intervention by reviewing and comparing agricultural practices of food production and food distribution to assess their impact on the environment and individual food choices[1,14]. Web-based interventions targeting college students[9-12,15] will be reviewed to identify important components that have been used to successfully modify nutrition related knowledge, attitudes and behaviors of college students. The intervention uses different models of instructional design[13,16,17], therefore details about the models used will be examined. In order to ensure that the intervention is effective, it is important to assess how the participants perceive the lessons. Accordingly, the use of formative evaluation assessment instruments[13] will be discussed. Additional intervention components, including the Transtheoretical Model (TTM)[17] and goal setting[18], will also be discussed.

Challenges of the Food System

The food system encompasses all aspects of food production[19]. The challenges of food system sustainability are broadly conceptualized into three main perspectives by Garnett[20]: 1) production efficiency, in which there is a need to make food production more sustainable by relying on fewer resources for food production, 2) demand restraint, which would require changes to dietary drivers that determine food production, and 3) system transformation, which requires changes in how the food system is administrated[20]. In order to fully address food system sustainability, all of

these perspectives need to be considered, however, system transformation is beyond the scope of this research project, thus will not be discussed.

The demand for nutritious food is increasing to meet the needs for a growing population[21]. The need to make food production more efficient and sustainable for the environment and human health is eminent. Technological innovations, such as matching inputs to outputs and recovering energy from agricultural waste, could improve agricultural efficiency[20]. Technological innovations to improve production efficiency post-harvest would include making refrigeration, manufacturing and transportation of food more efficient or based on renewable resources[20]. Improving methods of waste management, such as modifying packaging and portion sizes, is another method to improve production efficiency[20].

Foods that require a high amount of resource inputs for production and result in a high amount of undesired outputs, such as GHG emissions[20], are a concern food system sustainability[20]. In order to reduce the environmental impact of food production, the demand for these foods needs to be reduced[20]. Demand restraint seeks to curb consumption and steer consumers towards diets that are more plant-based and contain less meat and dairy products[20]. It has been suggested that demand restraint is protective of the environmental and human health[20,22-24].

Green Eating

Researchers at URI developed the term GE which includes the following GE practices: eating locally grown foods (choosing foods that are sourced from the surrounding region as often as possible, for example, while in Rhode Island, choosing foods grown and produced in New England), limiting the amounts of processed/fast

foods, eating meatless meals at least one day a week, choosing organic foods often or as much as possible and only taking the amount of food that you plan on eating. This has been modified from a previous GE definition[25]. An extensive literature review has been done to determine the environmental importance of these practices[26-31]. Increasing GE behaviors is critical for reducing the environmental effects of food production[32]. This literature review will focus on the environmental impact of conventional agriculture compared to sustainable agriculture, GE dietary behaviors and the environmental impact of eating locally grown foods and reducing food waste.

Research encompassing GE practices has been investigated in the general population[14,33]. Weatherell and colleagues[14] conducted a study in the United Kingdom to assess consumer's attitude about local food. This study used qualitative research methods, to explore consumers perceptions of food and farming and the link between the two, and quantitative methods, to explore association between consumer preferences, perceptions and interests. Results from this study show that attitudes about local foods vary among individuals; those that live in rural areas find local food to be of higher importance than those that live in urban areas. Overall, local food was viewed positively by participants, but was considered to be less important than selecting food that is tastes good, is fresh and good for health. The authors suggest there is a greater need for marketing of local foods and their benefits to society and the environment.

Tobler and colleagues[33] conducted a study in Switzerland to examine consumers beliefs about sustainable eating behaviors and their willingness to adopt such behaviors, they also examined different motives for eating more sustainably. The

authors targeted the following eating behaviors: avoiding food products with excessive packaging as a method of waste reduction, purchasing regional food, avoiding products that were imported by airplane, eating seasonal fruits and vegetables, purchasing organic food, and only consuming meat once or twice per week. Results from this study suggest consumers lack knowledge about the environmental impact of food consumption choices, therefore, information campaigns about this topic might be valuable. For example, participants believed reducing waste by avoiding products with excess packaging the most beneficial behavior to reduce environmental impact. This is different from the life cycle assessment the authors used for comparison which found reduction of packaging was of minimal environmental significance. The authors suggest emphasizing reduced meat consumption, avoiding food produced using heated greenhouse production and food distributed using air transportation as the behaviors would have greater environmental impact. This study also found young people are more motivated to purchase sustainable food for environmental reasons than older people, therefore highlighting sustainability could be effective in targeting young adults.

Conventional Agriculture Compared to Sustainable Agriculture and Stainable Diets

Conventional agricultural systems differ from farm to farm and country to country, however, they have the following common characteristics: rapid technological innovation; large capital investments; large-scale farms; single crops/ row crops grown continuously; uniform high-yield hybrid crops; extensive use of pesticides, fertilizers; high labor efficiency; and dependency on agribusiness[34]. Two of

the problems with agriculture, particularly with conventional agriculture, are energy use and pollution[35-39] which encompasses air pollution, biodiversity loss, water use and water pollution.

Air Pollution, Biodiversity Loss, Water Use and Water Pollution- Impact on the Environment

Air Pollution:

Some methods used in food production contribute to air pollution, such as livestock production, food distribution, vehicles used in farming and spraying of pesticides[37,39,40]. Some examples of air pollutants that are associated with agriculture are nitrous oxide, ammonia, volatile organic compounds and carbon monoxide [41,42]. Some of these emissions, particularly nitrous oxide, become trapped in the atmosphere[43]. This results in a decrease in the pH of rain known as acid rain [43]. It is possible that acid rain can change the pH of soil[43]. Acid rain can fall directly onto aquatic habitats and acid from soil leachate can cause acidification of surface water, causing algae blooms, loss of aquatic life and biodiversity[43,44]. It is suggested that high levels of air pollutants can cause increased temperature which could result in climate change[45]. Climate change can influence crop production as increased temperature and levels of CO_2 can cause plants (particularly wheat products) to grow in height more quickly while not fully maturing, resulting in less yield[46]. Subsequently, increased temperatures cause an increases in respiratory rate in humans resulting in increased inhalation of potentially toxic air pollutants which could increase mortality [47].

Biodiversity Loss:

The food system contributes to biodiversity loss as grassland and forestland that are converted for agriculture destroys natural habitats resulting in global extinctions of plant and animal species[48]. Ten to twenty percent of current grassland and forestland is projected to be converted to other uses by 2050, with agriculture projected to be the main consumer of this land[48]. Biodiversity loss as a result of increased agriculture can be seen throughout the food system: livestock farming affects biodiversity through heavy grazing and soil compaction; forest is lost when pastures and croplands are expanded; pollution of water with nutrients, drugs and sediments; and over-fishing resulting in extinction[49-52].

Water Use and Water Pollution:

The different stages of the food system require water use and can contribute to water pollution[53]. Agriculture is a major consumer of surface water and ground water in the United States, accounting for 80% of the water used in the United States[53]. Water is used in agriculture for irrigation, pesticide and fertilizer application, crop cooling and frost control[54]. One area of agriculture that uses a significant amount of water is livestock production; 29% of water used in the agricultural sector is used for livestock production[55-57]. Water is needed for livestock production to produce feed and drinking water for the animals, cleaning the animals and the animal's shelter, and for processing the animal's meat for human consumption[55-57]. One study shows that water consumption of animal products in an industrial food system is greater than water used for crop production even when equivalent nutritional value (calories, protein and fat) are taken into account[55].

Agriculture can contribute to water pollution as phosphorous and nitrogen that are commonly found in fertilizers can run off into surface water[58]. This can lead to eutrophication resulting in algae blooms[59]. As mentioned previously, some of agriculture's effects on air pollution can cause water pollution, nutrients leaching from soil and acid rain[43,44].

Conventional Agriculture: Effects on Health

The farming methods described above that are used with conventional agriculture allow for greater yield when compared to more sustainable farming methods, making food more available and affordable to for a growing population[60,61]. However, it is important to take what is being produced and the purpose of its production into consideration. Corn and soybeans are the two major crops produced in the United States[62]. These crops are used most commonly for animal feed products, as exports, and for production of sugar and oil including high fructose corn syrup and vegetable oil[62] which are commonly used to produce highly refined, processed foods [63] that are easily affordable, accessible and high in calories [64]. The United States Department of Research Services states that daily caloric intake has risen by 14.7% (over 300 calories) since 1984 with added fats, oils and sugar contributing to 7% of that increase[65,66]. Studies have shown diets high in these types of foods are detrimental to human health as they contribute to obesity and metabolic syndrome[67,68].

Inefficiency of Conventional Agriculture

The information presented above demonstrates some of the environmental effects of conventional methods of food production. In addition the current food system does not appear to accomplish its' principal function of feeding people

effectively[20]. Many are suffering consequences of eating too much of the foods that are being produced[68], many are wasting food[31] and others are going hungry[69]. With the expanding population growth[70], it is critical that methods of food production become more efficient while causing less environmental damage. In addition the food system has to increase access to foods that enhance human health and alter consumer preferences so that less of the foods causing environmental damage are consumed[20].

Sustainable Agriculture- Impacts on the Environment

The environmental impact of our food system, including deforestation, water pollution, fossil fuel consumption and climate change[71,72], can be reduced by adapting more environmentally conscious methods of food production and more environmentally conscious consumption behaviors[20,28,73]. Sustainable diets are those that contribute to food and nutrition security and a healthy life for the present and future generations[20,35,74]. They are protective and respectful of biodiversity and ecosystems, are culturally acceptable and accessible, and are economically fair and affordable[20,35,74]. They are nutritionally adequate, safe and healthy; while optimizing natural and human resources[20,35,74]. With the global population projected to exceed nine billion people before 2050[70] and the associated increase in food production to meet demand, making changes in food consumption patterns are becoming increasingly important to reduce the environmental impact of food production.

Sustainable agriculture refers to an integrated system of plant and animal production that will satisfy human needs for healthful food that promotes a healthy life without harming the environment[34]. A goal for sustainable agriculture is to increase food security for current and future generations, while enhancing environmental

quality and the natural resource base upon in which agriculture depends[34]. Sustainable

agriculture makes efficient use of non-renewable resources, sustaining the economic

viability of farm operations and enhancing the quality of life for farmers and society as

a whole[75].

Sustainable Diets- Nutritionally Adequate

Research has shown that diets can have low environmental impact, be adequate

in diet quality[76] and protective of health[22-24]. Davis et al.[23] assessed the environmental

impact of four different meals (meal one: pork chop produced with conventional feed,

potatoes, raw tomatoes, wheat bread and water. Meal two: pork chop with alternative

feed, potatoes, raw tomatoes, wheat bread and water. Meal three: sausage containing

90% pork and 10% pea protein, raw tomatoes, wheat bread and water. Meal four:

burger made with 100% pea protein, raw tomatoes, wheat bread and water) in two

different countries in terms of their global warming potential, eutrophication potential,

acidification potential, and the amount of energy needed to store and produce the

meal. In both countries, the pea burger (meal four) had the lowest global warming

potential, eutrophication potential and acidification potential. However, it needed a

comparable amount of energy to produce the meal because they authors assumed it

would be sold as a frozen product requiring energy to freeze the product at the

industry site and keep it frozen until it was ready to be consumed.

Kytzia and Faist developed and input-output model (called the economically

extended material flow analysis) to analyze different diets in Switzerland[77]. This

model looked at variables measured in physical units and variables measured in

monetary cost per physical unit of output. The authors found that a vegetarian diet

would reduce land and energy use compared to a lacto-ovo-vegetarian diet; however, the authors suggest it is important to consider that changing to this type of diet could weaken the agricultural economy of livestock in which a community might depend on.

Another environmentally conscious diet that is better known for its health benefits is the Mediterranean Diet[22]. This is a predominantly plant based diet that is low in meat and rich in fruits, vegetables, whole grains, legumes, nuts, fish and poultry, low in added sugar and salty snacks, low in saturated fat and rich in monounsaturated fats including olive oil[78]. When consuming a Mediterranean Diet, it is recommended the fruit and vegetables in this diet come from local or regional sources as they tend to be more accessible and fresh[22]. Diets that are high in meat and dairy products are high in saturated fat[79]; studies have shown that these types of diets increase risk for mortality[80,81] whereas diets rich in fruit, vegetables, vegetable proteins, whole grains, legumes, fish and olive oils can reduce the risk of cancer, heart disease, obesity and mortality[82-85], thus making it healthful for the environment and human consumption.

Conclusion- Conventional and Sustainable Agriculture and Sustainable Diets

The practices of conventional agriculture contribute to environmental degradation[34]. Conventional agriculture has the capacity to create large quantities of food[60,61], however, much of the food that is produced is highly refined and processed[62-64] which is harmful to human health[67,68]. Sustainable agriculture refers to agricultural practices that replenishes resources that are utilized[34]. With sustainable agriculture and sustainable diets, food is produced using farming techniques that are protective of the environment and human health[20,35,74].

Eating Local

Classification of Local Food Transactions

Local food transactions can be either direct-to-consumer, where the transaction
is done from farmer to consumer, or they can be direct-to-retail/foodservice, where the
transaction is done from the farmer to restaurants, retail stores, or institutions where
they are purchased by the consumer[26]. One popular way people practice local food
consumption is by shopping at farmers markets[26]. The number of farmers markets has
grown from 1,755 in 1998 to 5,274 in 2009[26]. Purchasing food from local food outlets
generally promotes better dietary choices and healthier eating[86] as most common food
items purchased at farmers markets were fresh fruits and vegetables, herbs, honey,
nuts[26]. A cross-sectional analysis demonstrated that 50% of children from families
who purchase local produce consume five or more servings of fruits and vegetables a
day[87] compared to less than 20% of children in the general population[88].

The Impact of Food Distribution on the Environment

An analysis of the environmental impact of the food chain includes the mode
of transportation that was used for distribution and the distance that the food item
traveled[20,28]. "Food miles" is a term used to describe how far food travels between its
production to the final consumer[27]. Most food in the United States travels 1,020 miles
from farm or production facility to the retail store[27] in comparison to local or regional
food which is consumed within 400 miles of its origin[26]. It has been suggested that
long distance trade results in increased GHG emissions[49,51]. Consuming regionally
produced meat and vegetables has less of an impact on the environment compared to

these foods transported via airplane[89]. Therefore, diets composed of local and regional foods can reduce energy costs and pollution associated with transportation[22,26,89].

Non- Environmental Benefits of Eating Locally

Although there may be varying opinions on the environmental impact of eating local, it is generally accepted that eating locally is beneficial to the local economy[26,90-94] as well as society[93,94] and can provide fresh, quality food[93,95] to consumers. Hillary and Houston conducted a market analysis in Michigan[96]. Results from this study demonstrated that for every $100 dollar spent within a local business $68 stays within that local economy compared to only $43 in a non-locally owned business[96]. In Rhode Island, the organization "Farm Fresh" works with family farms to get fresh produce, dairy and meat to consumers around Providence, Newport, Westerly and Boston[97]. Their work has resulted in a total of $4,047,315 economic gain for these communities[97]. Local food producers also improve food security within communities[94]; some examples of this include using supplemental nutrition assistance program benefits at local farmers markets[98] and by gleaning to collect food for free food programs[99].

Perceptions of Eating Locally

Consumers may find local foods to be of higher quality compared to foods grown from further distances and consume more fruits and vegetables than the general population[87] [88]. However, when consuming a diet consisting of local foods they are limited by what foods are grown and produced in their region[95]. In a qualitative study involving participants following a 100-mile diet, participants found following the diet difficult because they had to forgo some foods they would commonly eat, such as

beans and tofu, because they were produced outside their 100 mile radius[95]. Other

challenges faced by the participants included: a higher cost associated with local food,

perceptions of unhealthy diet restrictions (including inability to consume tofu and

beans as they were produced outside their 100 mile radius), increased time spent

preparing meals and avoiding eating at social situations or restaurants because the

food that was served was not always sourced within a 100 mile radius[95]. Despite the

challenges, the participants in this study generally reported having a positive

experience in following a 100-mile diet; positive remarks made by the participants

included: learning about the local food system; challenging themselves to eat locally;

enjoying the freshness, flavor and quality of the food; and believing their food

purchases improved the community[95].

Conclusion- Eating Local

Consuming a local diet consisting of regionally produced food is a method that

can be taken to reduce the environmental impact of the food system[89], improve the

local economy[26,92-94] and benefit social programs[94,98,99]. Consuming a local diet helps

people to learn about the food system[95] and to consume more fruits and vegetables[87],

therefore, eating local can improve diet quality. Providing information about eating

locally to young adults could be a valuable method used to educate this population on

the food system and increase their fruit and vegetable consumption.

Food Waste

Classification of Food Waste

There are various definitions and classifications for food waste[100,101].

Avoidable waste refers to food and drink that is thrown away because it is no longer

wanted; these foods may have expired or perished[100]. Possibly avoidable waste refers to foods that some people eat while others do not (such as apple or potato peels), food that can be eaten when prepared a certain way (such as pumpkin seeds), or unavoidable losses which includes food that cannot be eaten in any way (such as apple cores, banana peels or tea leaves)[100]. Harvesting, storage, transportation and processing losses that can only be salvaged using the best available technologies and extra cost are classified as unavoidable[100].

It has been suggested that over production of food contributes to both obesity and food waste[31]. Obesity is a result of excessive caloric consumption[102]; calories that are consumed in excess can be considered wasted calories as they are not needed and contribute to weight gain[31]. The high production of cheap, processed, and readily available food in the United States has made more food accessible. Addressing the oversupply of food energy may help curb both the obesity epidemic and food losses due to waste and over consumption[31].

In the university setting, dining halls are a primary source of food and food waste for thousands of college students[101]. It is suggested that food waste from these establishments may be as high as 20%[100]. One study conducted in a university dining facility found there was 5,829 pounds of edible food waste in one week[101]. Potential causes of food waste in the university setting include: overproduction; post inventory management; and fluctuation of sales[103]. In a university dining hall, food waste can include uneaten items from plates and excess food remaining on the service line[101]. This food can be considered edible compostable, meaning all food items that could be consumed by a human, or inedible compostable which includes bones, fruit peelings

and napkins[101]. Inedible, non-compostable items refers to items in the dining hall not meant for consumption eg. Aluminum foil and plastic wrappers[101].

Food is lost at all stages of the food supply chain, however, the frequency of different types of food lost during each stage of the food supply chain varies. During the production, postharvest, handling, and storage stage, the most common food losses are fruits and vegetables[104]. Factors contributing to food loss from these stages include: food not being harvested, food lost between harvest, sale and culling (the removal of products based on quality and appearance)[104]. During processing and packaging, grains products represent the largest amount of food loss[104]. Trimming, overproduction, product and packaging damages are the main reasons food is lost at this stage. With distribution and retail, the highest food loss comes from fruits, vegetables and seafood[104]. Proper handling of food is critical at this stage, for example, perishable foods must be kept at a safe temperature or else these foods are wasted[104]. It is estimated that one in seven truckloads of perishable food delivered to supermarkets gets thrown away[105]. Most food losses occur as consumer losses; 27% of grain products go to waste, 33% of seafood products go to waste, 28% of fruits and vegetables go to waste, 12% of meat goes to waste and 17% of dairy products go to waste. Of the foods listed, meat and dairy make a significant contribution to the GHG emissions and resources used by the agricultural sector[1].

Environmental Impact of Food Waste

Food waste accounts for 1.4 billion hectares of land across the globe, which is equivalent to 28% agriculture land use[106]. Food waste is the largest contributor to municipal solid waste going to landfills[104], where it rots and gradually turns into

methane gas and carbon dioxide [107]. In 2011 in the United States, landfills accounted

for 17.5% of these emissions and landfills have become one of the largest contributors

of methane production in the United States[107]. Wasted food represents a total loss of

energy invested in the production, transport and storage of that food[100]. The amount of

food wasted in the United States accounts for greater than 25% of freshwater use and

4% of oil consumed in United States[31]. In addition to using unnecessary resources,

food waste represents a loss of nutrients that could have otherwise been provided to

one of the 17.6 million households suffering from food insecurity in the United

States[69]. Therefore, finding methods to reduce food waste could lead to both

environmental and social benefits for future generations.

<u>Non-environmental motives to reduce Food Waste, Food Insecurity</u>

Nearly fifteen percent (14.5%) of the population in the United states is food

insecure[69] based on data collected from the United States Department of Agriculture

(USDA) in 2012. Food insecurity refers to the inability to provide sufficient food to all

members of the household due to lack of resources[69] which differs from food security

which exists when all people, at all times, have physical, social and economic access

to sufficient, safe and nutritious food[108]. The number of food insecure households was

virtually unchanged from data collected in 2008, suggesting the issue of food

insecurity is consistent. Five-point seven percent of the 14.5% of food insecure

households fall under the very low food security category, meaning their food intake

was reduced and their eating patterns were disrupted at times due to household lack of

food and other resources for food[69]. The USDA estimates that 30-40% of food from

retail stores, restaurants and homes is wasted in the United States, this equates to $390

lost annually per consumer[109]. The number of undernourished people has risen along with food production per capita, indicating that production of food alone is not the answer to curbing reducing hunger[110].

In addition to damaging the environment, food waste represents a loss of nutrients that could have otherwise been provided to one of the 17.6 million households suffering from food insecurity in the United States[69]. Although the issue of food waste is more pronounced in developed countries, its' consequences are also experienced in the developing world[111]. Food loses occur in the developed world at an average of 250-300 kg per year, amounting to 750-1,500 calories per person per day[111,112]. Food losses occur in developing countries at a rate of 120-220 kg of food per person per year, equating to 400-500 calories per person per year[111,112]. In addition to the previously described environmental benefits of reducing food waste, there are also social benefits to reducing food waste including donating safe and healthy food to food banks and food rescue organizations[113].

Attitudes about Food Waste

A study conducted in Sweden used a food waste diary with participants in 61 households to explore reasons for household food waste and to analyze the participant's attitudes about food waste[114]. The participants were divided into two groups, one of the groups received prior environmental education encompassing many environmental issues as part of a separate project while the other group received no environmental education before participating in the study. The food waste diary consisted of different parts, including measurement of food waste, why the waste occurred and questions about food packaging. Most of the food wasted in this study

included: fruit, vegetables, dairy and prepared food. Some of the most common reasons why food waste occurred were because the food item had gone bad, the package that was purchased was too big and it was difficult to empty, too much food was prepared and it was not possible to save the leftovers, and because children in the household did not want to finish their meals. The attitude among 96% of the participants was that food waste is not good. In the group that received environmental education before participating in the study, 25% of participants agreed to a high extent that more of the packaging should be removed from foods. The authors acknowledge that food packaging represents only a small amount of the environmental impact of the food system[115] compared to food waste, therefore education about the importance of reducing food waste and methods of reducing food waste is important.

Conclusion- Food Waste

All food waste contributes to an unnecessary loss of resources needed in the production of that food[100]. Food waste also represents a loss of nutrition that could have otherwise been provided to people suffering from food insecurity[69]. Consumers are aware that wasting food is not good[114], but often rate the importance of reducing packaging waste more important than reducing food waste[33]. Providing information about food waste and methods of how to reduce food waste could be a valuable method to reduce food waste.

Food Distribution and Food Waste- Increasing GHG

The food system produces GHG throughout its' entire process including how food is grown, distributed, preserved, sold, prepared, and disposed of [35]. Agricultural food production, agricultural land use and food distribution contribute to 22% of

49

global GHG[1,20,32]. Transportation and distribution of food as a whole represents an average of 11% of the GHG emissions of life-cycle analyses, with distribution from the producer to the retail facility accounting for 4%[27]. Waste removal also requires fossil fuel use for transportation therefore contributes to GHG emissions[35,116]. Additionally, rotting food waste creates methane gas, one of the most powerful GHG contributing to global warming[117]. Only three percent of food goes to compost sites in the United States[118], and most of our nation's food waste goes to landfills[104]. Reducing food waste can be an important method used to reduce GHG emissions by reducing the unnecessary loss of resources (including land, energy, fresh water and agricultural inputs) associated with the food system[35,100]. It is likely that agriculture is one of the largest contributors of methane and nitrous oxide[1], two of the main GHG contributing to global warming [117,119,120].

Using the Promotion of Environmentally Conscious Eating Behaviors to Improve the Dietary Habits of College Students

As mentioned previously, following environmentally conscious eating behaviors can be protective of the environment and human health [20,22,23,35]. Dietary intake of college students is nutritionally inadequate in terms of consuming less than the recommended amount of fruits and vegetables[7,121] and high intake of high fat fast-foods [7]. Pelletier et al. conducted a study at a community college and at a large university in Minnesota to determine if attitudes toward alternative food production practices, including eating organically, locally grown and minimally processed foods, was associated with improved dietary quality and eating habits [8]. This study included 1, 201 participants who took an online survey to assess student's diet, physical

activity, weight control behaviors and the personal, social and environmental factors that may influence these behaviors. Student's attitudes toward alternative production practices were measured by including items on the survey that asked how important it was that food in their diet was organically grown, made with organic ingredients, not processed, locally grown and grown using sustainable agricultural practices. Dietary quality was assessed over the previous 30 days using self-reported screeners developed by the National Cancer Institute [122] to assess fruit and vegetable intake, fiber, calcium, dairy and added sugars as well as a modified version of the Percentage Energy Fat Screener [123]. Other measures of dietary intake included self- reported behaviors of breakfast consumption, frequency of fast-food consumption and sugar sweetened beverage consumption. Results from this study demonstrated college students who consider alternative food production practices to be of high importance had a better diet quality and practiced more healthful eating behaviors than their peers as they consumed more fruits and vegetables, more dietary fiber, less fat and were more likely to consume breakfast, less likely to eat fast-food and consumed fewer sugar sweetened beverages. Results from this study suggest promotion of environmentally conscious food choices with college students could be advantageous in improving diet quality and increasing healthy eating behaviors among college students.

Web-based Interventions with College Students

A variety of web-based interventions have been used among college students to motivate and educate students to improve dietary behaviors. Milan and colleagues[10] found a web-based intervention based on the TTM to be an effective method to

improve self-efficacy and decisional balance to promote folic-acid containing multivitamin use among female college students. Poddar and colleges [11] found a web-based nutrition education course improved self-efficacy and self-regulation related to dairy intake with college students. Greene and colleagues [12] developed Project WebHealth, an experimental study which tested the impact of a web-based intervention for college students targeting increasing fruit and vegetable consumption and physical activity. Results showed this intervention to be an effective at increasing fruit and vegetable consumption and slowing the rate of decline in physical activity compared to the non-intervention group. These studies demonstrate the efficacy of web-based interventions as a method to modify the dietary behaviors of college students.

Researchers at URI are developing web-based interventions to promote GE. The first generation of these interventions was a pilot study applying the TTM[17] and the Social Cognitive Theory [124] to promote GE in the college student population [125]. The second generation of these interventions used the data collected from the first generation to make changes to and expand the lessons to better meet the needs of the college student population. It is important to assess the effectiveness of the second generation of the modules before the lessons can be finalized.

Instructional Design and Formative Evaluations

Gagnè and colleges[126] define instructional design as a teaching strategy to make the acquisition of knowledge and skills more effective and appealing. This process is used to determine the needs of the learner, define a goal to base instruction on and to create an intervention to assist in the transition. Formative evaluations are

used to test educational materials with learners then make revisions to the materials as necessary before finalizing them[127]. Dick and Carey contributed to instructional design by developing the Dick and Carey Systems Approach Model to Instructional Design which views instruction as a system which emphasizes the relationship between context, content, learning and instruction[16]. Dick and Carey use formative evaluations as part of their Systems Approach Model to Instructional Design to identify areas of the instructional materials that need improvement[16].

Keller defined a four dimension model to improve effectiveness of instructional design including four subscales: Attention, Relevance, Confidence and Satisfaction (ARCS)[13]. The ARCS model indicates that in order for motivation to be established and sustained, attention must be obtained and preserved throughout the lesson, relevance to learners' goals and needs must be made obvious, learners must feel confident in their ability to succeed in learning, and learners should feel satisfied about what they accomplished in the learning opportunity[128].

The Instructional Materials Motivation Survey (IMMS) was developed by Keller to assess the motivational features of instructional materials based on of the ARCS dimensions[13]. It accurately measures the learner's reactions and motivational attitudes to instructional materials[15,129]. This survey can be scored as a whole to find the total score or each subscale can be scored independently to find the subscale score[13]. The preferred scoring method of the IMMS is to find the average total score and the average score for each subscale[13]; scores greater than or equal to average (≥3.5) indicate motivational value[13,15]. If one of the subscales has an IMMS score lowing than 3.5, strategies can be used to make changes to the material to make it

more motivational and acceptable to the student[130]. The IMMS has been used with a variety of interventions involving college students[15,129,131]; results from these studies show the interventions that were provided motivated participants to make behavior change. Some studies using IMMS have shown that females score significantly higher than males[15,131]. IMMS scores are most useful when they are used to make changes to courses; one method of doing this is by providing feedback about the course to instructors after taking the course[13].

Dour and colleagues[15] used the IMMS to evaluate Project WebHealth. Results of this study showed procedures and components used in this study to be motivational and improve student's weight related health behaviors. The authors added additional questions to this survey to gain further insight including, "what did you find really helpful/ useful in the lessons?" and "what would you change about the lessons to better reach college students?"[15]. The authors suggest that increasing the interactive nature of the lessons could make them more personalized and beneficial to future studies. The authors also suggest that reducing lesson length and using enhanced technology could be beneficial for future studies[15].

Behavior Change

Transtheoretical Model (TTM)

There are many theories of behavior change, but the theory most widely applied in health settings is the TTM[132]. The TTM is a model of intentional change which focuses on the decision making of an individual[17]. This model defines behavior change as something that happens over time and includes five stages: pre-contemplation, contemplation, preparation, action and maintenance[17]. The stages of

change are both stable and changeable; individuals can progress and regress throughout the stages. In order to advance through the stages, the perceived "pros" must out-weight the perceived "cons" of making the change[17]. In addition, self-efficacy (confidence in changing behavior) must increase. Helping participants to set realistic goals can increase "pros" and improve self-efficacy and can decrease "cons"; this facilitates participants progression through the stages[17]. The TTM has been used in web-based interventions with college students[10,12].

Social Cognitive Theory (SCT)

The SCT can be used when developing interventions aiming to increase the likelihood of behavior change[133]. The SCT addresses the psychosocial dynamics influencing health behavior and provides methods for promoting behavior change[133]. This theory takes into account the ways in which behavior, personal factors and environmental influences interact[133]. This theory specifies a core set of determinants, the mechanism through which they work, and the optimal ways of translating this knowledge into effective practices[134]. The core determinants included in the SCT include knowledge, perceived self-efficacy, outcome expectations and the goals one sets for themselves and perceived facilitators/ impediments to the changes they seek[134]. Knowledge is the groundwork for change, if a person is unaware of the risks and benefits associated with making a change, they are less likely to do it[134]. Beliefs in personal efficacy in making the desired change are crucial and are the foundation to motivation and action[134]. Goals provide incentive and guides for making behavior change; long term goals set the course for behavior change and short term goals aid in guiding action in the present moment[134]. This theory can be used when developing

interventions to increase the likelihood of behavior change[133] and has been used in web-based interventions with college students[11,12].

<u>Goal Setting</u>

Locke describes the three key concepts of motivation as needs, values and goals, goals being the desired outcome[9,18]. Goal setting has been found to be effective at increasing performance by leading to arousal and discovery of information relevant to the goal[18] . More specific and difficult goals lead to a higher level of performance so long as the goal is achievable and the individual is devoted to reaching that goal[18].

O'Donnell and colleagues[9] explored the use of goal setting in Project Web-health, an online intervention targeting increasing fruit and vegetable consumption and decreasing the rate of decline of physical activity in college students. This study found the use of goal setting contributed to increasing fruit and vegetable consumption. This is consistent with other studies that have shown goal setting can be an effective method in making behavior change[135,136]. Results from this study demonstrated that goal setting can be effective at improving dietary outcomes of young adults.

<u>Self-Efficacy (SE)</u>

SE is part of the SCT, it is the one's belief in their ability to succeed in a given situation[134]. SE influences goals and aspirations; the higher perceived self-efficacy, the higher the goals people set for themselves and the stronger their commitment is to meeting their goal[134]. Those with high SE view obstacles in meeting the desired goal as something they can overcome, whereas those with low SE may give up on trying to reach their goal[134]. SE can be an important measurement to assess when using the

TTM to aid in progression through the stages of change[10,137]. SE has been measured in other studies with college students[10-12].

Conclusion

Agricultural practices, food production and food distribution impact the environment and individual food choices[1,14]. Food distribution impacts the environment by increasing GHG emissions.[49,51], therefore consuming more local foods could be beneficial for the environment[89]. Wasted food represents a total loss of energy invested in the production, transport and storage of that food[100]; thus decreasing food waste could reduce the environmental impact of the food system. Reducing the distance food travels and reducing the amount of wasted food could reduce GHG emissions associated with the food sector.

Young adults are in a developmental stage in life where they are becoming more responsible for themselves and making independent decisions[4] such as making their own dietary choices. Studies have shown that college students, ages 18-24, have poor diet quality including low intake of fruits, vegetables[5] and fiber[6] as well as a high intake of high-fat fried foods[7]. Promotion of environmentally conscious food choices with college students could be an effective method used to improve diet quality and increasing healthy eating behaviors among college students[8]. Web-based interventions have been a successful method of providing nutrition information to college students and are associated with dietary behavior changes[9-12].

Different models of instructional design exist which make the learning process more effective and interesting for the student. The ARCS model can be used to improve instructional design by finding a teaching strategy to instill motivation in the

student throughout a series of lesions. Student motivation can be measured using the IMMS; this survey has been successfully used in the college student population[15].

Knowledge can be presented to the student an appealing manner, however, increase in knowledge does not necessarily lead to behavior change. Goal setting can be effective at increasing performance and can be an effective method to aid in the progression through the stages of behavior change.

LITERATURE CITED

1. McMichael AJ, Powles J, Butler C, Uauy R. Food, livestock production, energy, climate change, and health. *Lancet.* Oct 6 2007;370(9594):1253-1263.
2. Dahm M, Samonte A, Shows A. Organic foods: do eco-friendly attitudes predict eco-friendly behaviors. *Journal of College Health.* 2009;58(3):195-202.
3. Kornelis M, Herpen E, Lans I, et all. Using non-food information to identify food-choice segment membership. *Food Quality and Preference* 2010;21(5):512-520.
4. Arnett J. Emerging adulthood: A theory of development from the late teens through the twenties. *American Psychologist.* 2000;55(5):469-480.
5. Reference Group Executive Summary, Fall 2011: Undergraduate Students Only. *American College Health Association National College Health Assessment Survey* 2011; http://www.acha-ncha.org/docs/ACHA-NCHA-II_UNDERGRAD_ReferenceGroup_ExecutiveSummary_Fall2011.pdf. Accessed September 22, 2013.
6. Huang TT, Harris KJ, Lee RE, Nazir N, Born W, Kaur H. Assessing overweight, obesity, diet, and physical activity in college students. *Journal of American college health : J of ACH.* Sep-Oct 2003;52(2):83-86.
7. Racette SB, Deusinger SS, Strube MJ, Highstein GR, Deusinger RH. Changes in weight and health behaviors from freshman through senior year of college. *Journal of nutrition education and behavior.* Jan-Feb 2008;40(1):39-42.
8. Pelletier J, Laska M, Neumark-Sztainer D, Story M. Positive Attitudes Toward Organic, Local, and Sustainable Foods are Associated with Higher Dietary Quality Among Young Adults. *Journal of the Academy of Nutrition and Dietetics.* 2012;113(1).
9. O'Donnell S, Greene G, Blissmer B. The effect of goal setting on fruit and vegetable consumption and physical activity level in a web- based intervention. *Journal of nutrition education and behavior.* (In Press).
10. Milan J, White A. Impact of a stage-tailored, web-based intervention on folic acid-containing multivitamin use by college women. *American journal of health promotion : AJHP.* Jul-Aug 2010;24(6):388-395.
11. Poddar KH, Hosig KW, Anderson ES, Nickols-Richardson SM, Duncan SE. Web-based nutrition education intervention improves self-efficacy and self-regulation related to increased dairy intake in college students. *J Am Diet Assoc.* 2010; 1723-1727. Available at: http://www.ncbi.nlm.nih.gov/pubmed/21034887. Accessed November 11, 2013.
12. Greene GW, White AA, Hoerr SL, et al. Impact of an online healthful eating and physical activity program for college students. *American journal of health promotion : AJHP.* Nov-Dec 2012;27(2):e47-58.
13. Keller JM. Motivational Design for Learning and Performance. New York Springer; 2010:277-286.

14.   Weatherell C, Tregear A, Allinson J. In search of the concerned consumer: UK public perceptions of food, farming and buying local. *Journal of Rural Studies.* 2003;19:233-244.

15.   Dour CA, Horacek TM, Schembre SM, et al. Process Evaluation of Project WebHealth: a Nondieting Web-Based Intervention for Obesity Prevention in College Students. *Journal of nutrition education and behavior.* 2013;45: 288-295. Feb 11 2013.

16.   Dick W, Carey L, Carey J. *The Systematic Design of Instruction* 6th ed: Pearson Education 2009.

17.   Prochaska JO. Decision making in the transtheoretical model of behavior change. *Medical decision making : an international journal of the Society for Medical Decision Making.* Nov-Dec 2008;28(6):845-849.

18.   Locke E. Motivation through conscious goal setting. *Applied and Preventitive Psychology.* August 1, 2013 1996;5:117-124.

19.   Discovering the Food System A Primer on Community Food Systems: Linking Food, Nutrition and Agriculture 2014; http://afsic.nal.usda.gov/farms-and-community/community-food-systems-and-civic-agriculture. Accessed March 11, 2014.

20.   Garnett T. Food sustainability: problems, perspectives and solutions. *The Proceedings of the Nutrition Society.* Feb 2013;72(1):29-39.

21.   Hobbs PR. Conservation Agriculture: what is it and why is it important for future sustainable food production? *Journal of Agricultural Science* 2007;145:127-137.

22.   Duchin F. Sustainable Consumption of Food. *Journal of Industrial Ecology* 2005;9(1-2):99-114.

23.   Davis J, Sonesson U, Baumgartner DU, Nemecek T. Environmental impact of four meals with different protein sources: Case studies in Spain and Sweden. *Food Research International.* 8// 2010;43(7):1874-1884.

24.   Marlow HJ, Hayes WK, Soret S, Carter RL, Schwab ER, Sabate J. Diet and the environment: does what you eat matter? *The American journal of clinical nutrition.* May 2009;89(5):1699S-1703S.

25.   Weller KE, Greene GW, Redding CA, et al. Development and Validation of Green Eating Behaviors, Stage of Change, Decisional Balance, and Self-efficacy Scales in College Students. *Journal of nutrition education and behavior.* (In Press).

26.   Martinez S, Hand M, Da Pra M, et al. Local food Systems, Concepts and Issues. 2010; http://purl.access.gpo.gov/GPO/LPS125302. Accessed July 17, 2013.

27.   Weber CL, Matthews HS. Food-miles and the relative climate impacts of food choices in the United States. *Environmental science & technology.* May 15 2008;42(10):3508-3513.

28.   Carlsson-Kanyama A, Gonzalez AD. Potential contributions of food consumption patterns to climate change. *The American journal of clinical nutrition.* May 2009;89(5):1704S-1709S.

29. Pimentel D, Pimentel M. Sustainability of meat-based and plant-based diets and the environment. *The American Journal of Clinical Nutrition.* Sep 2003;78(3 Suppl):660S-663S.

30. Hansen B, Alrøe HF, Kristensen ES. Approaches to assess the environmental impact of organic farming with particular regard to Denmark. *Agriculture, Ecosystems and Environment.* 2001;83:11-26.

31. Hall KD, Guo J, Dore M, Chow CC. The progressive increase of food waste in America and its environmental impact. *PloS one.* 2009;4(11):e7940.

32. Friel S, Dangour AD, Garnett T, et al. Public health benefits of strategies to reduce greenhouse-gas emissions: food and agriculture. *Lancet.* Dec 12 2009;374(9706):2016-2025.

33. Tobler C, Visschers V, Siegrist M. Eating green. Consumers' willingness to adopt ecological food consumption behaviors. *Appetite.* July 15, 2013 2011;57:674-682.

34. Gold MV. Sustainable Agriculture: Definitions and Terms 1999; http://www.nal.usda.gov/afsic/pubs/terms/srb9902.shtml#toc2. Accessed January 30, 2014.

35. Garnett T. Where are the best opportunities for reducing greenhouse gas emissions in the food system (including the food chain)? *Food Policy.* 2011;36:523-532.

36. Khan S, Hanjra MA. Footprints of water and energy inputs in food production – Global perspectives. *Food Policy.* 4// 2009;34(2):130-140.

37. Starmer E. Environmental and Health Problems in Livestock Production: Pollution in the Food System. *The Agribusiness Accountability Innitiative* Vol 2.

38. Rich Pirog TVP, Kamyar Enshayan, Ellen Cook. Food, Fuel, and Freeways: An Iowa perspective on how far food travels, fuel usage, and greenhouse gas emissions. 2001.

39. Persistent Organic Pollutants: A Global Issue, A Global Response. 2012; http://www.epa.gov/oia/toxics/pop.html. Accessed December 2 2013.

40. Pirog R, Benjamin, A. Checking the Food Odometer: Comparing Food Miles for Local versus Conventional Produce Sales to Iowa Institutions. 2003; http://www.leopold.iastate.edu/pubs-and-papers/2003-07-food-odometer. Accessed March 11, 2013.

41. Lin C. California's Agriculture-Related Local Air Pollution Policy. *Journal of Environmental Protection.* 2013;4:24-27.

42. Jacobson MZ. Short-term effects of agriculture on air pollution and climate in California. *Journal of Geophysical Research.* 2008;113.

43. Menz FC, Seip HM. Acid rain in Europe and the United States: an update. *Environmental Science & Policy.* 8// 2004;7(4):253-265.

44. Effects of Acid Rain - Surface Waters and Aquatic Animals. 2012; http://www.epa.gov/acidrain/effects/surface_water.html. Accessed December 2, 2013.

45. Burkart K, Canário P, Breitner S, et al. Interactive short-term effects of equivalent temperature and air pollution on human mortality in Berlin and Lisbon. *Environmental pollution.* 12// 2013;183(0):54-63.

46. Agriculture and Food Supply 2013; http://www.epa.gov/climatechange/impacts-adaptation/agriculture.html. Accessed December 7, 2013.

47. Gordon CJ. Role of environmental stress in the physiological response to chemical toxicants. *Environmental research.* 5// 2003;92(1):1-7.

48. Duraiappah AK, Naeem S. *Ecosystems and Human Well-Being: Biodiversity Synthesis* 2005.

49. Herrero M, Thornton PK, Gerber P, Reid RS. Livestock, livelihoods and the environment: understanding the trade-offs. *Current Opinion in Environmental Sustainability.* 12// 2009;1(2):111-120.

50. Nepstad DC, Stickler CM, Almeida OT. Globalization of the Amazon soy and beef industries: opportunities for conservation. *Conservation biology : the journal of the Society for Conservation Biology.* Dec 2006;20(6):1595-1603.

51. Hobbs NT, Galvin KA, Stokes CJ, et al. Fragmentation of rangelands: Implications for humans, animals, and landscapes. *Global Environmental Change.* 10// 2008;18(4):776-785.

52. Reid RS, Bedelian C, Said MY, et al. *Livestock in a Changing Lanscape: Drivers, Consequences and Repsonses-Global Livestock Impacts on Biodiversity* Island Press 2009.

53. Irrigation & Water Use. 2013; http://www.ers.usda.gov/topics/farm-practices-management/irrigation-water-use.aspx#.Up6S6sRDuoM. Accessed December 3, 2013.

54. Other Uses and Types of Water: Agricultural Water 2009; http://www.cdc.gov/healthywater/other/agricultural/. Accessed December 3, 2013.

55. Mekonnen MM, Hoekstra AY. A Global Assessment of the Water Footprint of Farm Animal Products *Ecosystems* 2012;15:401-415.

56. Beckett JL, Oltjen JW. Estimation of the water requirement for beef production in the United States. *Journal of animal science.* Apr 1993;71(4):818-826.

57. Chapagain AK, Hoekstra AY. *Virtual water flows between nations in relation to trade in livestock and livestock products. Value of Water Research Report Series No. 13.* Delft, the Netherlands: UNESCO-IHE2003.

58. Hilton J, O'Hare M, Bowes MJ, Jones JI. How green is my river? A new paradigm of eutrophication in rivers. *Science of The Total Environment.* 7/15/ 2006;365(1–3):66-83.

59. Littler MM, Littler DS, Brooks BL. Harmful algae on tropical coral reefs: Bottom-up eutrophication and top-down herbivory. *Harmful algae.* 10// 2006;5(5):565-585.

60. de Ponti T, Rijk B, van Ittersum MK. The crop yield gap between organic and conventional agriculture. *Agricultural Systems.* 4// 2012;108(0):1-9.

61. Verena Seufert, Navin Ramankutty, Foley JA. Comparing the yields of organic and conventional agriculture. *Nature.* 2012;485:229-232.

62. Major Crops Grown in the United States. 2013; http://www.epa.gov/oecaagct/ag101/cropmajor.html. Accessed December 5, 2013.

63. FDA Targets Trans Fat in Processed Foods. 2013; http://www.fda.gov/forconsumers/consumerupdates/ucm372915.htm. Accessed October 1, 2013.

64. Write SM, Aronne LJ. Causes of Obesity. *Abdominal imaging.* 2012;37(5):730-732.

65. Kantor LS. A Comparison of the U.S. Food Supply With the Food Guide Pyramid Recommendations. *Agricultural Economics Reports* Washington, D.C.: United States Department of Agriculture, Economic Research Services 1998.

66. Putnam J. U.S. Food Supply Providing More Food and Calories *Food Review* 1999;22(3).

67. What Is Metabolic Syndrome? http://www.nhlbi.nih.gov/health/health-topics/topics/ms/printall-index.html. Accessed December 5, 2012.

68. Bocarsly ME, Powell ES, Avena NM, Hoebel BG. High-fructose corn syrup causes characteristics of obesity in rats: Increased body weight, body fat and triglyceride levels. *Pharmacology Biochemistry and Behavior.* 11// 2010;97(1):101-106.

69. Coleman-Jensen A, Nord M, Singh A. Household Food Security in the United States in 2012. USDA; 2012.

70. Global population to pass 10 billion by 2100, UN projections indicate. 2011; http://www.un.org/apps/news/story.asp?NewsID=38253#.UT4MSRxQFqV. Accessed March 11, 2013.

71. Thibert J, Badami MG. Estimating and communicating food system impacts: A case study in Montreal, Quebec. *Ecological Economics.* 8/15/ 2011;70(10):1814-1821.

72. Brown EL. Feeding seven billion people well. Plan B 2.0 Rescuing a Planet Under Stress and a Civilization in Trouble. New York W.W. Norton & Company; 2006. Accessed February 2, 2014

73. Carlsson-Kanyama A. Climate change and dietary choices- how can emissions of greenhouse gases from food consumption be reduced? *Food Policy.* 1998;23(277-93).

74. FAO. *Sustainable Diets and Biodiversity Directions and Solutions for policy, Research and Action* Rome 2010.

75. Legal definition of sustainable agricululture 2009; http://www.csrees.usda.gov/nea/ag_systems/in_focus/sustain_ag_if_legal.html. Accessed October 27, 2013.

76. Guenther PM, Casavale KO, Reedy J, et al. Update of the Healthy Eating Index: HEI-2010. *Journal of the Academy of Nutrition and Dietetics.* Apr 2013;113(4):569-580.

77. Kytzia S, Faist M, Baccini P. Economically extended—MFA: a material flow approach for a better understanding of food production chain. *Journal of Cleaner Production.* 10// 2004;12(8–10):877-889.

78. Mediterranean diet: A heart-health eating plan 2013; http://www.mayoclinic.com/health/mediterranean-diet/CL00011. Accessed December 7 2013.

79. Saturated Fat. 2012; http://www.cdc.gov/nutrition/everyone/basics/fat/saturatedfat.html.Accessed October 3, 2014.

80. Heidemann C, Schulze MB, Franco OH, van Dam RM, Mantzoros CS, Hu FB. Dietary patterns and risk of mortality from cardiovascular disease, cancer, and all causes in a prospective cohort of women. *Circulation.* Jul 15 2008;118(3):230-237.

81. Sinha R, Cross AJ, Graubard BI, Leitzmann MF, Schatzkin A. Meat intake and mortality: a prospective study of over half a million people. *Archives of internal medicine.* Mar 23 2009;169(6):562-571.

82. Tyrovolas S, Panagiotakos DB. The role of Mediterranean type of diet on the development of cancer and cardiovascular disease, in the elderly: A systematic review. *Maturitas.* 2// 2010;65(2):122-130.

83. Panagiotakos DB, Chrysohoou C, Pitsavos C, Stefanadis C. Association between the prevalence of obesity and adherence to the Mediterranean diet: the ATTICA study. *Nutrition.* 5// 2006;22(5):449-456.

84. Zazpe I, Sánchez-Tainta A, Toledo E, Sánchez-Villegas A, Martínez-González MÁ. Dietary Patterns and Total Mortality in a Mediterranean Cohort: The SUN Project. *Journal of the Academy of Nutrition and Dietetics.*2014;114(1): 37-47.

85. Tantamango-Bartley Y, Jaceldo-Siegl K, Fan J, Fraser G. Vegetarian diets and the incidence of cancer in a low-risk population. *Cancer epidemiology, biomarkers & prevention : a publication of the American Association for Cancer Research, cosponsored by the American Society of Preventive Oncology.* Feb 2013;22(2):286-294.

86. Salois MJ. Obesity and diabetes, the built environment, and the 'local' food economy in the United States, 2007. *Economics & Human Biology.* 1// 2012;10(1):35-42.

87. Racine EF, Mumford EA, Laditka SB, Lowe AE. Understanding Characteristics of Families Who Buy Local Produce. *Journal of nutrition education and behavior.* 1// 2013;45(1):30-38.

88. Guenther PM, Dodd KW, Reedy J, Krebs-Smith SM. Most Americans eat much less than recommended amounts of fruits and vegetables. *Journal of the American Dietetic Association.* Sep 2006;106(9):1371-1379.

89. Jungbluth N, Tietje O, Scholz RW. Impacts from the Consumer's Point of View Investifated with a Modular LCA *International Journal of Life Cycle Assessments* 2000;5(3).

90. Peters CJ, Bills NL, Wilkins JL, Fick GW. Foodshed analysis and its relevance to sustainability. *Renewable Agriculture and Food Systems.* 2008;24(1):1-7.

91. Marsden T, Banks J, Bristow G. Food Supply Chain Approaches: Exploring their Role in Rural Development. *Sociologia Ruralis* 2000;40(4):424-437.

92. Payne T. U.S. Farmers' Markets 2000: A Study of Emerging Trends. *Journal of Food Distribution Research.* 2002;33(1):173-175.

93. Brown C. Consumers' preferences for locally produced food: A study in southeast Missouri. *American Journal of Alternative Agriculture.* 2003;18(4):213–224.

94. McCullum C, Desjardins E, Kraak VI, Ladipo P, Costello H. Evidence-based strategies to build community food security. *Journal of the American Dietetic Association.* 2// 2005;105(2):278-283.

95. Byker C, Rose N, Serrano E. The benefits, challenges, and strategies of adults following a local food diet. *Journal of Agriculture, Food Systems, and Community Development.* 2010;1(1):125-138.

96. Elissa Sangalli Hillary, Houston D. Local Works! Examining the Impact of Local Business on the West Michigan Economy. 2008. Accessed April 13, 2014.

97. Results: Market Mobile by the Numbers. http://www.farmfresh.org/hub/index_numbers.php. Accessed December 8, 2013.

98. Candace Young, Allison Karpyn, Nicky Uy, Katy Wich, Glyn J. Farmers' markets in low income communities: impact of community environment, food programs and publicpolicy. *Community Development.* 2011;42(2):208-220.

99. Hoisington A, Butkus SN, Garrett S, Beerman K. Field Gleaning as a Tool for Addressing Food Security at the Local Level: Case Study. *Journal of Nutrition Education.* 1// 2001;33(1):43-48.

100. Beretta C, Stoessel F, Baier U, Hellweg S. Quantifying food losses and the potential for reduction in Switzerland. *Waste management.* Mar 2013;33(3):764-773.

101. Sarjanhani A, Serrano EL, Johnson R. Food and Non-Edible, Compostable Waste in a University Dining Facility. *Journal of Hunger & Environmental Nutrition.* 2009;4:95-102.

102. What Causes Overweight and Obesity? 2012; http://www.nhlbi.nih.gov/health/health-topics/topics/obe/causes.html. Accessed December 8, 2013.

103. Whitehair KJ, Shanklin CW, Brannon LA. Written messages improve edible food waste behaviors in a university dining facility. *Journal of the Academy of Nutrition and Dietetics.* Jan 2013;113(1):63-69.

104. Gunders D. *Wasted: How America Is Losing Up to 40 Percent of Its Food from Farm to Fork to Landfill.* Natural Resources Defense Council;2012.

105. P. Beswick, Matthew Isotta, Winter S. *A Retailer's Recipe for Fresher Food and Far Less Shrink.* Boston, MA

106. *Food Wasteage Footprint Impacts on Natural Resources Summary Report* 2013.

107. National Greenhouse Gas Emissions Data. 2013; http://www.epa.gov/climatechange/ghgemissions/usinventoryreport.html. Accessed November 29, 2013

108. Food security statistics. 2013; http://www.fao.org/economic/ess/ess-fs/en/. Accessed October 30, 2013.

109. USDA and EPA Launch U.S. Food Waste Challenge. 2013; http://www.usda.gov/wps/portal/usda/usdahome?contentid=2013/06/0112.xml. Accessed October 5, 2014.

110. Jagerskog A, Clausen TJ. *Feeding a Thirsty World - Challenges and Opportunities for a Water and Food Secure Future. Report Nr. 31.* SIWI, Stockholm 2012.
111. group Twb. *Food Price Watch.* February 2014 2014.
112. Global food losses and food waste. 2011; http://www.fao.org/docrep/014/mb060e/mb060e00.pdf. Accessed June 20, 2013.
113. Food Waste Basics. 2013; http://www.epa.gov/foodrecovery/. Accessed June, 18 2013.
114. Williams H, Wikström F, Otterbring T, Löfgren M, Gustafsson A. Reasons for household food waste with special attention to packaging. *Journal of Cleaner Production.* 3// 2012;24(0):141-148.
115. Jørgen Hanssen O. Environmental impacts of product systems in a life cycle perspective: a survey of five product types based on life cycle assessments studies. *Journal of Cleaner Production.* 9// 1998;6(3–4):299-311.
116. Food Waste Facts. http://www.unep.org/wed/quickfacts/. Accessed June 20, 2013.
117. Overview of Greenhouse Gases. 2013; http://www.epa.gov/climatechange/ghgemissions/gases.html. Accessed July 5, 2013.
118. *Municipal Solid Waste Generation, Recycling, and Disposal in the United States Tables and Figures for 2010.* November 17, 2013 2011.
119. Climate Change Indicators in the United States. 2013; http://www.epa.gov/climatechange/science/indicators/ghg/ghg-concentrations.html. Accessed July 5, 2013.
120. Bernstein L, et al. Climate Change 2007: Synthesis Report *An Assessment of the Intergovernmental Panel on Climate Change* 2007.
121. *American College Health Association. National College Health Assessment. Reference group executive summary Spring 2013.* American College Health Association 2013.
122. Short Dietary Assessment Instruments *Applied Research Cancer Control and Population Sciences* National Cancer Institute 2013.
123. Graham DJ, Laska MN. Nutrition Label Use Partially Mediates the Relationship between Attitude toward Healthy Eating and Overall Dietary Quality among College Students. *Journal of the Academy of Nutrition and Dietetics.* 3// 2012;112(3):414-418.
124. Bandura A. Social Cognitive Theory of Self-Regulation *Organizational Behavior and human decision processes* 1991;50:248-287.
125. Eastman K, Greene G. The "Green Eating" Project: A Pilot Intervention to Promote Sustainable and Healthy Eating in College Students 2012 http://digitalcommons.uri.edu/srhonorsprog/286/. Accessed April 27 2013.
126. Gagné R. *The Conditions of Learning and Theory of Instruction.* 4 ed: Holt, Rinehart and Winston; 1985.
127. Reiser R, Dempsey, J. *Trends and Issues in Instructional Design and Technology.* 3rd ed. Upper Sadle River, NJ: Pearson Education 2012.

128. Keller J. Development and use of the ARCS model of instructional design *Journal of Instructional Development.* 1987;10(3):2-10.

129. Gao T. The Effects of Different Levels of Interaction on the Achievement and Motivational Perceptions of College Students in a Web-based Learning Environment. *Journal of Interactive Learning Research.* 2003;14(4):367-386.

130. Keller JM. Strategies for Stimulating the Motivation to Learn. *Performance and Improvment.* 1987;26(8):1-7.

131. Cook DA, Thompson WG, Thomas KG. The Motivated Strategies for Learning Questionnaire: score validity among medicine residents. *Medical education.* Dec 2011;45(12):1230-1240.

132. Why it's hard to change unhealthy behavior- and why you should keep trying. 2014; http://www.health.harvard.edu/newsweek/Why-its-hard-to-change-unhealthy-behavior.htm. Accessed March 16, 2014.

133. Glanz k, Rimer BK, Lewis FM. *Health Behavior and Health Education Theory, Research and Practice* thrid edition ed: Hossey-Bass Wiley Imprint; 2002.

134. Bandura A. Health Promotion by Social Cognitive Means. *Health education & behavior : the official publication of the Society for Public Health Education.* 2004;21(2).

135. Miller C, Headings A, Payrot M, Nagaraja H. Goal difficulty and goal commitment affect adoption of a lower glycemic index diet in adults with type 2 diabetes. *Patient education and counseling.* 2012;86:84-90.

136. Webber Cullen K, Thompson D, Scott R, Lara-Smalling A, Watson K, Konzelmann K. The impact of gaol attainment on behavioral and mediating variables among low income women participating in an Exanded Food and Nutrition Education Program intervention study. *Appetite.* 2010;55:305-310.

137. O'Hea EL, Boudreaux ED, Jeffries SK, Carmack Taylor CL, Scarinci IC, Brantley PJ. Stage of change movement across three health behaviors: the role of self-efficacy. *American journal of health promotion : AJHP.* Nov-Dec 2004;19(2):94-102.

APPENDIX B

TABLES AND FIGURES

TABLE 1. DETAILED CONTENT OF THE GREEN EATING (GE) MODULES

	Introduction to GE	**Eating Local**	**Waste-less**
Topics Covered	What is GE; what are food systems; issues with unsustainable food systems; principles of GE.	What is eating local; why eat local; where to get local food; how to eat local year round.	What is food waste; why care about food waste; how can we waste less, composting.
Video Topics	Conventional agriculture; sustainable agriculture; fossil fuels.	Eating local; why eat local.	Big retail food waste.
Additional Learning Tools	GE calculator.	Definition of localvore; Rhode Island (RI) local food guide; farmers markets, community supported agriculture, food co-ops and health food store in RI; list of different produce produced in each season.	Statistics about food waste; web links provided with additional information on impact of tray-less dining in dining halls; food insecurity; composting.
Key Concepts	The difference between conventional and sustainable agriculture; benefits of sustainable agriculture on environment and future generations; information on how to eat Green.	Eating local is better for the environment and for the local economy; average distance food travels is 1500 miles.	Problems with food waste; how to waste less; what can you do.
Behavioral Objectives	Increase awareness of GE.	Increase local food consumption.	Decrease edible food waste.

TABLE1: DETAILED CONENT OF THE GREEN EATING (GE) MODULES, (CONTINUED)

	Introduction to GE	Eating Local	Waste-less
Behavior Quiz	Description of their diet and consideration of environmental impact when making food choices.	Purchasing food and knowledge or where food comes from.	How often they waste food, purchase items in bulk, use reusable items and their familiarity with composting.
Knowledge Assessment	Definitions for GE and sustainability, description of food system, percentage of fossil fuels needed for food production.	Benefits of eating local; miles food travels; farmers market growth.	Largest source of food waste and the amount of food wasted.

TABLE 2: ADDITIONAL EVALUATION ITEMS- QUESTIONS AND POSSBLE RESPONS

Question Number	Question	Possible Responses					
1	Rate the degree to which the module motivated you to change:	1 Not at all	2 Slightly	3 Moderately	4 Mostly	5 Very Much	6 Choose not to answer
2	What was your overall opinion of the module?	1 Not good at all	2 Needs improvement	3 Satisfactory	4 Good	5 Excellent	6 Choose not to answer
3	How likely would you be to recommend the module to a friend?	1 Not at all	2 Slightly	3 Moderately	4 Mostly	5 Very Much	6 Choose not to answer
4	What is a goal you can make associated with the module you viewed?	This question was open-ended					
5	How confident are you at meeting this goal?	1 Not at all	2 Slightly	3 Moderately	4 Mostly	5 Very Much	6 Choose not to answer
6	What did you find really helpful/useful in this module?	This questions was open-ended					
7	What would you change to better reach college students?	This question was open-ended					

TABLE 3: EXAMPLES OF BEHAVIOR QUIZ QUESTIONS FOR EACH MODULE

Module	Question	Possible Answers (and Scores)				
Introduction to GE	*"How often do you consider the environmental impact when making food choices?"*	Never (0)	Rarely (0)	Some-times (1)	Often (2)	Almost Always (3)
Eating Local	*"When you purchase food, where to do you go most frequently?"*	Grocery Store/ Conven-ience Store (1)	Farmers market (3)	My own backyard (3)	I usually eat at the dining hall (0)	Other (0)
Waste-less	*"When you go up to the serving line at the dining hall do you…"*	Scoop whatever you want onto your plate – "if it looks good, I'm gonna try it!" (0)	Take what you can eat, but usually end up with some leftover (1)	Eat everything on your plate and only discard napkins, peels, ect." (2)	Take less than you think you can consume and go up for seconds if you're still hungry (3)	

TABLE 4: EXAMPLES OF KNOWLEDGE ASSESSMENT QUESTIONS FOR
EACH MODULE

Module	Question	Possible Answers (And Scores)				
Introduction to GE	*"What best describes the food system?"*	The way food is grown or produced (0)	The way food is manu-factured (0)	The way food is trans-ported (0)	The way food is eaten (0)	All of the above describe a food system (1)
Eating Local	*"The average bite of food the American eats travels more than 1500 miles"*	True (1)	False (0)			
Waste Less	*"How much food in landfills is actually edible?"*	10% (0)	25% (1)	30% (0)	50% (0)	

TABLE 5: DEMOGRAPHIC DATA OF PARTICIPANTS

	Introduction (n=167)	Eating Local (n=29)	Waste-less (n=28)	Total (n=224)
Age (n=224)	19.1 ± 1.2	19.8± 1.7	19.3 ± 1.3	19.2± 1.3
Gender (n=223)[1]				
Male	48 (28.9%)	3 (10.3%)	3 (10.7%)	54 (24.2%)
Female	118 (71.1%)	26 (89.7%)	28 (89.3%)	172 (77.1%)
Year in School (n= 224)				
Freshman	107 (64.1%)	11 (37.9%)	14 (50.0%)	132 (58.9%)
Other	60 (36.0%)	18 (62.1%)	14 (49.9%)	92 (40.9%)
Race (n=224)				
White	145 (86.8%)	28 (96.6%)	25 (89.3%)	198 (88.3%)
Other	22 (13.2%)	1 (3.4%)	3 (10.7%)	26 (11.6%)
Field of Study (n=224)				
Health or Science	106 (63.5%)	12 (41.1%)	10 (35.7%)	128 (56.6%)
Other	61 (36.5)	17 (58.9%)	18 (64.3)	96 (43.4%)
Stage of Change (n=212)[2,3]				
Pre-Action	132 (82.5%)	22 (84.6%)	19 (73.0%)	173 (81.6%)
Pre-contemplation	32 (20.0%)	3 (11.5%)	3 (11.5%)	38 (17.9%)
Contemplation	72 (45.0%)	12 (46.2%)	12 (46.2%)	96 (45.2%)
Preparation	28 (17.5%)	7 (26.9%)	4 (15.4%)	39 (18.3%)
Post-Action	28 (17.5%)	4 (15.3%)	7 (26.9%)	48 (22.6%)
Action	11 (6.9%)	1 (3.8%)	2 (7.7%)	23 (10.8%)
Maintenance	17 10.6%)	3 (11.5%)	5 (19.2%)	25 (11.7%)

[1] One participant selected, "I choose not to answer".

[2] 12 participants did not answer the SOC question

[3] Introduction to GE (n=160), Eating Local (n=26), Waste-less (n=26), Total (n=212)

TABLE 6. INSTRUCTIONAL MATERIALS MOTIVATION SURVEY (IMMS)
AVERAGE SUBSCALE SCORE AND TOTAL SCORE BY MODULE

	Introduction (n=138)	Eating Local (n=25)	Waste-less (n=21)	F ratio (df)	P Value
Attention[2]	$3.7 \pm .6$	$3.8 \pm .7$	$3.8 \pm .6$	.33 (2,190)	.71
Relevance[3]	$3.4 \pm .6^a$	$3.5 \pm .6^{ab}$	$3.8 \pm .7^b$	3.38* (2,192)	.03*
Confidence[4]	$4.0 \pm .6$	$3.9 \pm .5$	$4.1 \pm .7$	.71 (2, 191)	.49
Satisfaction[5]	$3.1 \pm .8$	$3.0 \pm .9$	3.3 ± 1.0	.52 (2,189)	.59
Total IMMS	$3.6 \pm .5$	$3.5 \pm .5$	$3.7 \pm .6$	1.29 (2,181)	.27
Number scoring $\geq$ 3.5[1]	69 (50%)	15 (60%)	14 (66%)		

[a,b] differing superscript letter denote significant difference between groups

*p <.05

[1] 98 participants (57%) received IMMS score $\geq$3.5 (χ^{2}=2.2 [df= 2], p=.34)

[2] Introduction to GE (n=145), Eating Local (n=26), Waste-less (n=22)

[3] Introduction to GE (n=148), Eating Local (n=26)

[4] Introduction to GE (n=147), Waste-less (n=22)

[5] Introduction to GE (n=144), Eating Local (n=26), Waste-less (n=22)

TABLE 7. GOAL CONGRUENCY AND SELF-EFFICACY BETWEEN MODULES

	Introduction (n=150)	Eating Local (n=25)	Waste-less (n=23)	Total (n=198)	X^2 (df)
Goal Congruent	114 (76%)	23 (92%)	16 (69.5%)	153 (77.2%)	3.16 (4), p=.53
Goal Incongruent	36 (24%)	2 (8%)	7 (30.4%)	45 (22.7%)	
Self-efficacy*[2] (mean ± SD)	$3.5^a \pm 1.0$	$3.5^a \pm 1.0$	$4.1^b \pm .8$	3.5 ± 1.0	F= 4.99 (df=2), p=.001

[a,b] Means with different superscript differ (Tukey p<.05)

*p =.008

[2] Introduction to GE (n=146), Eating Local (n=26), Waste-less (n=22), Total (n=194)

TABLE 8. COMPARISON OF BEHAVIOR AND KNOWLEDGE SCORE BY MODULE

	Introduction (n=167)	Eating Local (n=29)	Waste-less (n=28)	TOTAL
Behavior Quiz				
Low	29 (17.4%)	4 (13.8%)	6 (21.4%)	39 (17.4%)
Medium	97 (58.0%)	14 (48.3%)	15 (53.6%)	126 (56.3%)
High	41 (24.6%)	11 (37.9%)	7 (25.0%)	59 (26.3%)
Number (Percent) of Participants Scoring High (≤1 incorrect response) on the Knowledge Assessment*	123 (73.7%)	17 (58.6%)	21 (75.0%)	161 (71.9%)
*χ^2= 2.9 $^{(df=2),}$ p= 2.33				

TABLE 9. COMPARISON OF ADDITIONAL EVALUATION ITEMS BY MODULE

	Introduction (n=151) Mean ± SD	Eating Local (n=26) Mean ± SD	Waste-less (n=22) Mean ± SD	Average Score	F ratio (df)
Motivation to change (n=200)*	2.7 ± .8[a]	2.8 ± .9[ab]	3.1 ± .9[b]	2.7 ± .8	4.38 (2)
Opinion of module[1]	3.8 ± .8	3.5 ± .8	3.8 ± .8	3.8 ± .8	1.36 (2)
Recommend module to friend[2]	2.9 ± 1.1	2.6 ± 1.0	3.0 ± 1.3	2.9 ± 1.1	.981 (2)
*p= .034 [a,b] differing superscript letters denote significant difference between groups (p=.029) [1]Introduction to GE (n=149) [2]Introduction to GE (n=150)					

FIGURE 1: ORDER OF THE GREEN EATING MODULE TASKS COMPLETED
BY THE PARTICIPANTS

Demographics

↓

Behavior Quiz

↓

Viewed Module Content

↓

Knowledge Assessment

↓

IMMS/ Addition Evaluation Items

CONSENT FORM AND SURVEYS

Consent Form:

The University of Rhode Island
Department of Nutrition and Food Science
Ranger Hall, Ranger Rd. Kingston, RI 02881
Evaluation of the Green Eating Project

Consent form for Research

You have been invited to take part in a research project described below. The researcher will explain the project to you in detail upon request. You should feel free to ask questions either in person or by email at gwg@uri.edu. If you have more questions later Professor Geoffrey Greene, the person mainly responsible for this study, 401-874-4028, will discuss them with you. You must be at least 18 years old to be in this research project.

Description of the project:
You have been asked to take part in a study that will ask questions to evaluate modules about pro-environmental eating choices, known as green eating.
What will be done:
If you decide to partake in this study, here is what will happen: You will fill out a survey, which should take about 15 minutes. All of the questions being asked have come from established survey instruments. If you complete the survey, in combination with viewing the module, you will receive class credit for your participation.
Risk or discomfort:
The questions being asked should not pose any discomfort. If any question poses discomfort, simply refrain from answering that question.
Benefits of this study:
Although there will be no direct benefit for you, the results from this study will be used to make changes to modules regarding content,

application, appearance etc. The modules will be used during an intervention during the Fall semester of 2013.
Confidentiality:
Your participation in this survey will remain confidential. If you wish to receive extra credit you must complete viewing the module as well as completing the survey. Any information linking your name or personal information will be removed from your responses before data analysis and deleted once class credit has been provided.

You should understand that any form of communication over the internet does carry a minimal loss of confidentiality. None of the information will identify you by name. At the end of the study, the unidentifiable data will be stored on a password-protected computer.

Decision to quit at any time:
The decision to take part in this study is up to you. You do not have to participate. If you decide to take part in the study, you may quit at any time. Whatever you decide will not affect your status as a student or your grade in this class. You will, however, only receive extra credit if you complete viewing the module and complete the survey. If you wish to withdraw from the study after submitting your survey, simply inform Professor Geoffrey Greene at 401-874-4028 of your decision before class credit has been provided and the link between personal information and survey responses has been deleted.
Rights and Complaints:
If you are not satisfied with the way this study is performed, or have any questions about your rights as a research subject, you may discuss your complaints with Professor Geoffrey Greene (401-874-4028). In addition, if you have any questions of your rights as a research participant you may contact the office of the Vice President for Research, 70 Lower College Road, Suite 2, University of Rhode Island, Kingston, Rhode Island, telephone: (401) 874-4328.

I prefer not to

I agree to participate

University of Rhode Island

Demographic information, IMMS and Additional Evaluations Items:

First, we need to know a little about you - please complete the following:

1. What is your age (in years)? <18, 19, 20, 21, 22, 23, 24, >24

2. What is your birthdate? (month drop down; day drop down; year drop down)

2. What is your gender? ( ) Male ( ) Female ( ) Choose not to answer

3. Which one of the following best applies to you?

White
Black or African American
Hispanic/ Latino
Asian
Native Hawaiian or Other Pacific Islander
American Indian or Alaska Native
Mixed
Other
Choose not to answer

4. What is your year in school? (drop down menu) freshman (year 1) etc.

5. What is your current major? _____ (open ended)

 6. Green eating includes, participating in most of the following behaviors:
• Eating locally grown foods, produce that is in season and limited intake of processed foods.
• Consuming foods and beverages that are labeled fair trade certified or certified organic.
• Consuming meatless meals weekly and (if consuming animal products) selecting meats,
poultry and dairy that do not contain hormones or antibiotics.

Based on the above definition for green eating, which of the following best describes you
now:

I do not regularly practice green eating and do not intend to start within the next 6 months
I am thinking about practicing green eating within the next 6 months
I am planning on practicing green eating within the next 30 days
I regularly practice green eating and have been doing so for less than 6 months
I regularly practice green eating and have been doing so for 6 months or more
I choose not to answer

Please think about each statement in relation to the Green Eating module you have recently completed, and indicate how true it is. Give the answer that <u>truly applies to you</u>, and not what you would like to be true, or what you think others want to hear. Think about each question <u>by itself</u> and indicate how true it is. Do not be influenced by your answers to other statements.

1. When I first looked at this module, I had the impression that it would be easy for me.
   Not true 1
   Slightly true 2
   Moderately true 3
   Mostly true 4
   Very true 5
   Choose not to answer 6

2. There was something interesting at the beginning of the module that got my attention.
   Not true 1
   Slightly true 2
   Moderately true 3
   Mostly true 4
   Very true 5
   Choose not to answer 6

3. This material was more difficult to understand than I would like for it to be.
   Not true 1
   Slightly true 2
   Moderately true 3
   Mostly true 4
   Very true 5
   Choose not to answer 6

4. Early in the module, I felt confident that I knew what I was supposed to learn from it.
   Not true 1
   Slightly true 2
   Moderately true 3
   Mostly true 4
   Very true 5
   Choose not to answer 6

5. Completing the exercises in the module gave me a satisfying feeling of accomplishment.
   Not true 1
   Slightly true 2
   Moderately true 3
   Mostly true 4
   Very true 5
   Choose not to answer 6

6. It is clear to me how the content of the material related to things I already know.
   Not true 1
   Slightly true 2
   Moderately true 3
   Mostly true 4

Very true 5
Choose not to answer 6

7. Most of the pages had so much information that it was hard to pick out and remember the important things.
    Not true 1
    Slightly true 2
    Moderately true 3
    Mostly true 4
    Very true 5
    Choose not to answer 6

8. The material was eye-catching.
    Not true 1
    Slightly true 2
    Moderately true 3
    Mostly true 4
    Very true 5
    Choose not to answer 6

9. There were stories, pictures, or examples that showed me how the materials could be important to some people.
    Not true 1
    Slightly true 2
    Moderately true 3
    Mostly true 4
    Very true 5
    Choose not to answer 6

10. Completing the module was important to me.
    Not true 1
    Slightly true 2
    Moderately true 3
    Mostly true 4
    Very true 5
    Choose not to answer 6

11. The quality of the writing helped to hold my attention.
    Not true 1
    Slightly true 2
    Moderately true 3
    Mostly true 4
    Very true 5
    Choose not to answer 6

12. The module was so abstract that it was hard to keep my attention on it.
    Not true 1
    Slightly true 2
    Moderately true 3
    Mostly true 4
    Very true 5

83

Choose not to answer 6

13. As I worked on the module, I was confident that I could learn the content.
Not true 1
Slightly true 2
Moderately true 3
Mostly true 4
Very true 5
Choose not to answer 6

14. I enjoyed the module so much that I would like to know more about this topic.
Not true 1
Slightly true 2
Moderately true 3
Mostly true 4
Very true 5
Choose not to answer 6

15. The pages of the module look dry and unappealing.
Not true 1
Slightly true 2
Moderately true 3
Mostly true 4
Very true 5
Choose not to answer 6

16. The content of this material is relevant to my interests.
Not true 1
Slightly true 2
Moderately true 3
Mostly true 4
Very true 5
Choose not to answer 6

17. The way the information is arranged helped keep my attention.
Not true 1
Slightly true 2
Moderately true 3
Mostly true 4
Very true 5
Choose not to answer 6

18. There are explanations or examples of how people use the knowledge in the activities.
Not true 1
Slightly true 2
Moderately true 3
Mostly true 4
Very true 5
Choose not to answer 6

19. The exercises in the modules were too difficult.
    Not true 1
    Slightly true 2
    Moderately true 3
    Mostly true 4
    Very true 5
    Choose not to answer 6

20. The activities had things that stimulated my curiosity.
    Not true 1
    Slightly true 2
    Moderately true 3
    Mostly true 4
    Very true 5
    Choose not to answer 6

21. I really enjoyed studying this module.
    Not true 1
    Slightly true 2
    Moderately true 3
    Mostly true 4
    Very true 5
    Choose not to answer 6

22. The amount of repetition in the module caused me to get bored sometimes.
    Not true 1
    Slightly true 2
    Moderately true 3
    Mostly true 4
    Very true 5
    Choose not to answer 6

23. The content and style of writing in this module conveyed the impression that the content is worth knowing.
    Not true 1
    Slightly true 2
    Moderately true 3
    Mostly true 4
    Very true 5
    Choose not to answer 6

24. I learned some things that were surprising or unexpected.
    Not true 1
    Slightly true 2
    Moderately true 3
    Mostly true 4
    Very true 5
    Choose not to answer 6

25. After working on this module for awhile, I was confident that I would be able to pass a test on it.

Not true 1
Slightly true 2
Moderately true 3
Mostly true 4
Very true 5
Choose not to answer 6

26. This module was not relevant to my needs because I already knew most of it.
Not true 1
Slightly true 2
Moderately true 3
Mostly true 4
Very true 5
Choose not to answer 6

27. The wording of feedback after the exercises, or of other comments in the module, helped me feel rewarded for my effort.
Not true 1
Slightly true 2
Moderately true 3
Mostly true 4
Very true 5
Choose not to answer 6

28. The variety of reading passages, exercises, illustrations, etc., helped keep my attention to the module.
Not true 1
Slightly true 2
Moderately true 3
Mostly true 4
Very true 5
Choose not to answer 6

29. The style of writing is boring.
Not true 1
Slightly true 2
Moderately true 3
Mostly true 4
Very true 5
Choose not to answer 6

30. I could relate the content of this module to things I have seen, done, or thought about in my own life.
Not true 1
Slightly true 2
Moderately true 3
Mostly true 4
Very true 5
Choose not to answer 6

31. There are so many words on each page that it is irritating.

Not true 1
Slightly true 2
Moderately true 3
Mostly true 4
Very true 5
Choose not to answer 6

32. It felt good to complete the module.
Not true 1
Slightly true 2
Moderately true 3
Mostly true 4
Very true 5
Choose not to answer 6

33. The content of this module will be useful to me.
Not true 1
Slightly true 2
Moderately true 3
Mostly true 4
Very true 5
Choose not to answer 6

34. I could not really understand quite a bit of the material in this module.
Not true 1
Slightly true 2
Moderately true 3
Mostly true 4
Very true 5
Choose not to answer 6

35. The good organization of the content helped me be confident that I would learn this material.
Not true 1
Slightly true 2
Moderately true 3
Mostly true 4
Very true 5
Choose not to answer 6

36. It was a pleasure to work on such a well designed module.
Not true 1
Slightly true 2
Moderately true 3
Mostly true 4
Very true 5
Choose not to answer 6

Please think about the following statements in relation to the Green Eating module you have recently completed, and give the answer that applies to you.

37. Rate the degree to which the module motivated you to change:
     Not at all 1
     Slightly 2
     Moderately 3
     Mostly 4
     Very much 5
     Choose not to answer 6

38. What was your overall opinion of the module?
     Not good at all 1
     Needs improvement 2
     Satisfactory 3
     Good 4
     Excellent 5
     Choose not to answer 6

39. How likely would you be to recommend the module to a friend?
     Not at all 1
     Slightly 2
     Moderately 3
     Mostly 4
     Very much 5
     Choose not to answer 6

40. What is a goal you can make associated with the module you viewed? (open ended)

----

41. How confident are you in meeting this goal?
    Not at all 1
    Slightly 2
    Moderately 3
    Mostly 4
    Very much 5
    Choose not to answer 6

42. What did you find really helpful/useful in this module?
------------------------------------- --

43. What would you change to better reach college students?
_____

To receive extra credit for participation in this survey **you must provide the following** (this information is for class credit and will be deleted before data are analyzed):

URI Student ID: _____

Email: _____

What class are you in (choose one)?

AFS/AVS 132

URI 101

NFS 276

Com 100

NFS 207

NFS 210

Other (please specify)

Thank You

Behavior Quiz- Introduction to GE:

1. How would you describe your diet?

     a) I eat mostly plants such as fruits, vegetables, beans, legumes, nuts and grains

     b) I eat all of the above including eggs and dairy

     c) I eat all of the above including poultry

     d) I eat all of the above including red meat

     e) I eat mostly answers b - d

2. How well do you know about the environmental impact of food?

     a) I didn't know there was an environmental impact

     b) I know a little bit

     c) I have some knowledge on the topic

     d) I know quite a bit

     e) I think I know but I'd like to know more

3. How often do you consider the environmental impact when making food choices?

     a) Never

     b) Rarely

     c) Sometimes

     d) Often

     e) Almost Always

4. How important do you think sustainability is?

     a) Not at all important

     b) Somewhat important

     c) Neutral

     d) Very Important

     e) Extremely important

     f) Wait…what does sustainability mean?

5. What does green eating mean?

     a) Eating foods that are the color green

     b) Eating only expensive foods.

     c) Eating foods that are produced using sustainable environmental practices.

Behavior Quiz- Eating Local

1) When you purchase food, where do you go the most frequently?

      a) Grocery store/convenience store

      b) Farmer's market

      c) My own backyard

      d) I usually eat at the dining hall

      e) Other

2) What would you consider as "eating local"?

      a) Within my backyard

      b) Within my town/county

      c) Within my state

      d) Within my country

      e) Anywhere!

3) How often do you attend farmer's markets?

      a) Never

      b) Sometimes

      c) Only in the summertime

      d) Often

      e) All the time, even in winter!

4) How well do you know where your food was grown?

      a) I only know what it says on the package.

      b) I know some details.

      c) I know the farm and the farmer!

      d) I don't know but I would like to know more.

5) When purchasing food, what is the most important characteristic?

      a) Freshness/taste

      b) Cost

      c) Growing practices

      d) Local/origin

      e) I don't care as long as it's edible.

Behavior Quiz- Waste Less

1. When you go up to the serving line at the dining hall do you...

    a) Scoop whatever you want onto your plate - "If it looks good, I'm gonna try it!"

    b) Take what you can eat, but usually end up with some leftover

    c) Eat everything on your plate and only discard napkins, peels, etc.

    d) Take less than you think you can consume and go up for seconds if you're still hungry

2. When you buy food do you...

    a) Buy whatever is cheapest, especially prepackaged products in bulk

    b) Usually eat at the dining hall but occasionally purchase prepackaged items at the convenience store

    c) Only buy what you can use in the next few weeks

    d) Buy raw ingredients in bulk at places such as Whole Foods

3. How often do you opt for reusable items?

    a) I double bag my groceries and keep my iced double venti mochachino latte cold with a styrofoam jacket - brr!

    b) Disposable coffee cups and plastic grocery bags is how I roll.

    c) Plastic shopping bags are okay if I repurpose or recycle them. How else do you expect me to line my garbage cans and make homemade parachutes?

    d) I religiously bring my own travel mug and shopping bag wherever I go.

4. What is compost?

    a) What the heck is compost? Isn't that some hippie thing..?

    b) I've heard of it - think it has to do with food scraps? I know plenty of dorms with old food!

    c) I know people who compost and I would if I could.

    d) I'm a composting nut! I have my own bin in my room!

Knowledge Assessment- Introduction to GE

1. Green eating means:

   a) Eating foods that are the color green

   b) Eating only expensive foods.

   c) Eating foods that are produced using sustainable environmental practices.

2. Sustainability refers to a process that degrades resources as to not leave any for future generations.

   a) TRUE

   b) FALSE

3. What best describes a food system?

   a) The way food is grown and produced

   b) The way food is manufactured

   c) The way food transported

   d) The way food is bought and eaten

   e) All of the above describe a food system

4. The Dead Zone in the Gulf of Mexico is caused by:

   a) Oil spills

   b) Overpopulation of fish

   c) Agricultural runoff

   d) Under-population of fish

5. What percentage of all fossil fuels is used to produce food?

   a) 10%

   b) 17%

   c) 32%

   d) 50%

Knowledge Assessment- Eating Local

1) Which of the following in NOT a benefit of eating local?

   a) Supports local farmers

   b) Reduces "food miles"

   c) Supports Fair Trade

   d) All of the above are benefits of eating local

2) The average bite of food the American eats travels more than 1500 miles

   a) True

   b) False

3) What is a "locavore"?

   a) A person who runs a formers market

   b) A person who eats at local restaurants

   c) A person who only eats foods grown within a 100 mile radius

   d) A person who only eats local produce

4) As of 2012, how many farmer's markets existed in the United States?

   a) 8261

   b) 7864

   c) 5043

   d) 2604

   e) 4876

5) Which of these foods likely traveled the farthest to get to the grocery store in the middle of winter?

   a) Wheat Grass

   b) Mushrooms

   c) Peaches

   d) Sprouts

   e) Cauliflower

Knowledge Assessment- Waste Less

1. What is the largest source of food waste in the US?

      a) Waste on-farm

      b) Waste from grocery stores

      c) Left-overs

      d) Take-out food

2. Of the food produced in the US:

      a) 5-10% is wasted each year

      b) 10-20% is wasted each year

      c) 20-30% is wasted each year

      d) 30-40% is wasted each year

3. On average, how many kcalories are wasted per person per day?

      a) 800

      b) 1250

      c) 1400

      d) 2000

4. How much food in landfills is actually edible?

      a) 10%

      b) 25%

      c) 30%

      d) 50%