"Food for Thought" for Student-Athletes: An Online Education Program Aimed to Fuel Student-Athletes with Sports Nutrition and Mental Health Knowledge and Resources

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Project Brief

Nutrition is a key component of optimum performance, physical health, and mental health in student athletes. In addition, it has been well established in the research that student athletes face tremendous pressure to perform well academically and in their sport. This can lead to stress, anxiety, lack of sleep, and other factors that can impact their mental health. Overall well-being of student athletes, both while they are in college and long term, should be a goal of all universities. In this project, researchers implemented a self-paced online nutrition and mental wellness education program. The program consisted of ten modules that included topics such as nutrition, sleep habits, anxiety, depression, eating disorders, and life after college. Seventy-four participants at a southern Division 1 university enrolled in this program, with 50 percent of the participants completing every module. Quantitative findings revealed a significant p value =0.004 for pre/post knowledge of the Sports Nutrition Knowledge Assessment instrument items. When non validated instrument items were included in analysis, no significant results were noted (p=.080). Individual interviews with both athletes and administrators indicated a mostly positive view of both the content and method of delivery. An online education component of a general sports nutrition program offers some unique benefits. However, it may lack the depth of in person and sport specific educational experiences and structure to engage all target student-athletes.

Problem Statement

Through an examination of college campuses nationwide, researchers have discovered that nutrition habits and food security are closely correlated to grade point average (Paul, Panton, & Marzigliano, 2008; Trockel, Barnes, & Egget, 2000), academic progress (Gallegos, Ramsey & Ong, 2014), and self-reported health condition (Patton-López, López-Cevallos, Cancel-Tirado, & Vazquez 2014). National Collegiate Athletic Association (NCAA) student-athletes may be at a higher risk from food insecurity due to the strenuous physical demands placed on their bodies and the need for more nutrients to sustain those demands (Thomas, Burke, & Erdman, 2016).

It has been well established by historic research that student-athletes experience stressors—such as demands on their time, pressures to perform, injuries, and physical exhaustion that might result in burnout—beyond those experienced by a typical college student (Sudano, Collins, & Miles, 2017). If these stressors are not managed in a healthy way, they could lead to instances of anxiety, depression, and even suicide (Armstrong, Burcin, Bjerke, & Early, 2015).

Aligned with NCAA's Best Mental Health Practices, and in order to optimize our student-athletes' performance, recovery, and holistic wellbeing, we must take an integrated and intentional approach that includes training coupled with ongoing support for smart nutritional and mental health practices.

Literature Review

Nutrition is a key component to optimizing an athlete's performance and recovery (American College of Sports Medicine, 2009). Athletes have increased energy and nutrient needs and likely benefit from individual supplementation to accommodate for long practices and restrictive time and travel schedules (Krieder, Wilborn, Taçylor, Campbell, Almada, & Collins, 2010). If trends of highly competitive NCAA Division-1 programs are any indication of the importance of food in collegiate athletes, it could be assumed that athletes with poor nutrition may be greatly disadvantaged compared to peers with robust nutrition support from their universities. A survey conducted of 31 NCAA Division-1 programs in 2015 found that after the NCAA deregulation of food on fueling student-athletes, food budgets increased by an average of 145%. The average athletic food budget per school rose from $534,130 to $1.308 million (CPSDA, 2015).

Beyond the increased nutrition needs of athletic activity, some student-athletes may be at even greater risk of undernutrition due to food insecurity. The USDA defines food security as "access by all people at all times to enough food for an active, healthy life" (USDA, 2018). Individuals with a low level of food security cannot reliably obtain enough food to maintain their health and wellbeing. Not all student-athletes receive full sports scholarships or financial support from their families.

Food security in the student population should be a concern of education administration and policy makers as there appears to be a link between nutritional intake and academic performance in university students. Multiple studies indicate that nutrition habits share a relationship with grade point average (Paul, Panton, & Marzigliano, 2008; Trockel, Barnes, &

Egget, 2000). Food insecurity has also been associated with delayed academic progress and poorer fruit and vegetable intake (Gallegos, Ramsey & Ong, 2014). Some modifiable factors such as a student-athlete's living quarters or ease of access to a vehicle are also related to fruit and vegetable intake and level of food security (Mirabitur, Peterson, Rathz, Mathlen, & Kasper, 2016). Compared to students who are food secure, students with a low level of food security are found to self-report a poorer health condition and achieve a lower grade point average (Patton-López, López-Cevallos, Cancel-Tirado, & Vazquez 2014).

Other initiatives supported by the NCAA include the mental health and well-being of student athletes and support for these athletes after they graduate from college (NCAA, 2020). In 2019, Division 1 student athletes spent an average of 33 hours per week on athletics and 35.5 hours per week on academics (GOALS study). They reported sleeping an average of 6 hours and 15 minutes per night. Students also reported coming into college already feeling overwhelmed by all they have to do, especially female students (GOALS). In the NCAA GOALS study, athletes noted that they would like to have more information regarding: proper nutrition (males: 42%; females 55%); time management (males: 29%; females: 34%); and getting good sleep (males: 28%; females: 38%) (NCAA, 2020).

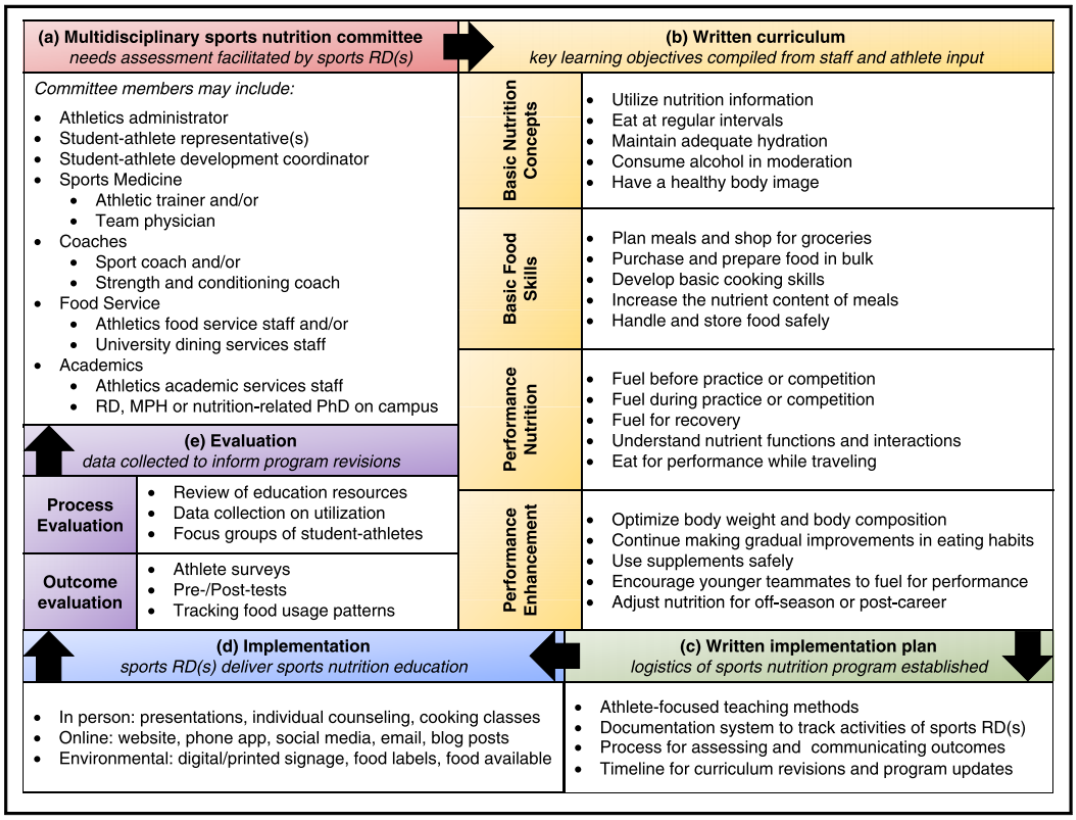
In the NCAA GOALs study, 41% of males and 58% of females noted that they wished that their coaches and other athletics administrators would provide more information regarding preparing for life after they graduate from college (NCAA, 2020).

Each of these topics was addressed in this online sports nutrition education program for athletes.

Conceptual Framework

Sports Nutrition Education Programs for Athletes

Curriculum development followed the general flow and guideline of Parks et al. (2017) outline:



Previous research reviews examining sports nutrition indicate education interventions are effective at eliciting knowledge and performance gains in collegiate athletes (Sanchez-Diaz, et al. 2020). Online nutrition education programs have also been described as methods for achieving measurable health and performance related outcomes in athletes (Shoemaker et al. 2019).

Methodology and Data Collection

Participants

Participants of this study were recruited from Division-1 varsity student-athletes who ranged from 18-22 years in age and were enrolled in at least 12 credit hours at a southern US university. Recruitment methods included word-of-mouth advertising, team meetings arranged with coaches, flyers, and e-mail. A total of 74 participants enrolled in the program (21 males, 53 females). Fifty percent of the participants completed all 29 education modules in the program with an average completion of 16.5 education modules per participant. Participants were incentivized by offering "snack stipends" to their team for practice and competition. A pool of $10,000 was set aside and an equal percentage was awarded to each participant's team, up to 10 per team. An additional $1,000 stipend was awarded to the top performing men's and women's team. After completion of the program, the sports dietitian met with each team to order snacks and food that corresponded with their snack stipend awarded from participation.

Procedures

Participants were enrolled in a self-paced online nutrition and mental wellness education program. Before enrolling, a participation form was provided and explained by the researcher in accordance with the local university's Institutional Review Board (IRB) guidance. Handouts, videos, worksheets, and surveys covering 10 different topics were released to an online course portal (Healthie) and were accessible via smartphone or computer. The module topics can be found in Figure 1.

Figure 1

Schedule of Module Topics

Overview of Module Topics: ***Food for Thought for Student-Athletes***	
Week 1	Nutrition: An Overview of Quality
Week 2	Nutrition: Food Security and Resources for Student Athletes
Week 3	Mental Health: Eating Disorders
Week 4	Mental Health: Mindfulness and Coping with Stressors
Week 5	Nutrition: NCAA Rules on Supplements and Identifying Credible Information
Week 6	Nutrition: Meal Planning, Budgeting, and Campus Meal Plans
Week 7	Mental Health: Anxiety and Depression
Week 8	Mental Health: Sleep
Week 9	Nutrition and Mental Health: Tying it All Together
Week 10	Nutrition and Mental Health: Transition Strategies for Post-Grad Life

The program began as soon as athletes enrolled and ended when all modules were completed. The last day of the school semester was the cutoff point for data.

An online knowledge assessment survey was conducted before and after participation in the program. Ten participants completed both exams in their entirety. This instrument consisted of both self-developed and previously validated (Karpinski et al., 2019) items.

As a component of the course, other previously validated surveys were distributed to participants including sleep index (Driller, et al. 2018), food security (USDA, 2017), eating disorder (McNulty, 2001), anxiety (Kroenke, 2007) and depression (Kroenke, 2001).

After completion of all course modules, participants were also invited to participate in an in-depth interview to discuss perceptions of the program and the impact of the program qualitatively. A descriptive and exploratory case study approach was used. A case study approach allowed for data to be collected and then analyzed through qualitative analysis techniques (Denzin & Lincoln, 2013). In this research, each participant was a case study. Data was collected using a semi-structured interview. Qualitative data was analyzed using interpretive analysis. An interpretivist theoretical perspective is one that attempts to "make sense" of data that are collected in qualitative research (Denzin & Lincoln, 2013, p. 30).

The first step in the analysis process was listening to and transcribing the data, which is a form of content analysis (Patton, 2015). Each transcript was read, then re-read with open coding (Strauss & Corbin, 1990) to mark key elements of the transcript. Data was then moved into categories with the purpose of creating "analytic power" (Strauss & Corbin, 1990, p. 113). Quantitative data was analyzed Microsoft Excel to conduct a paired samples, 1 tailed T-test to determine knowledge gains between the pre and post knowledge assessment.

Findings/Results

Quantitative Results

Overall, 79 individuals participated including 73 student-athletes and 6 coaches and staff. Only 10 SAs completed both the pre/post knowledge assessment. The results indicated a significant p value =0.004 for pre/post knowledge of the SNKI instrument items. When non validated instrument items were included in analysis, no significant results were noted (p=.080). Respondent data of the assessment surveys sleep index (Driller, et al. 2018), food security (USDA, 2017), eating disorder (McNulty, 2001), anxiety (Kroenke, 2007) and depression (Kroenke, 2001) are summarized in *Table 1* below.

Screening Method	Participants Screened	Notes
Mental Health (anxiety/depression)	22	14% reported high anxiety or depression (According to PHQ-9 and GAD-7)
ASBQ Sleep Screening	25	28% reported poor sleep behavior (according to ASBQ)
FAST Eating Disorder Screening	22	14% reported subclinical eating disorder (according to FAST)
Food Insecurity Screening	10	30% reported low food security (according to USDA 6-item)

Table 1.

Qualitative Results

Three participants completed the qualitative interview: two student athletes and one administrator within the athletic department. Data was analyzed using the methods outlined above.

Overall, six categories were identified in the transcripts. They included: *General Assessment of (A) Content and (B) Accessibility, Holistic Content, Suggestions for Improvement, Reaching out to the RDN, Changing Habits,* and *Increasing Participation.*

General Assessment of (A) Content and (B) Accessibility. Overall, comments regarding the program content were positive. Student athletes appreciated that neither the amount nor type of information presented was overwhelming. They felt that an appropriate amount of information was provided, and that they learned something from each module. One athlete noted that they had not paid much attention to nutrition prior to completing the modules. They appreciated that the information was credible, easily accessible, and provided additional resources should they have an interest in a particular topic, such as eating disorders or anxiety. They noted that a balance of information was provided between the various athletes and were aware that it was designed as an entry level program with basic nutrition and wellness information designed to appeal to several types of athletes, as well as males and females.
The information in the modules was presented in a variety of ways, including PowerPoints, videos, quizzes, surveys, and links to reputable websites. This was an aspect of the program that the participants appreciated as it held their attention. One athlete noted that they did not want the modules to feel like "a homework thing, or the whole class where I'm memorizing information, which I'm glad it wasn't." The administrative staff stated that this was a "very worthwhile thing" for the students and staff to complete.

Holistic Content. A recurring theme mentioned in all three interviews was that the program was more well-rounded than they anticipated. Most were expecting only nutrition information to be provided and were surprised by the mental health components of the program.

The administrative staff stated that it was not "merely a nutrition program; it's more of a wellness program in a broader sense." This participant specifically mentioned that they appreciated the information regarding eating disorders and improved sleep habits. One athlete stated that they have utilized the stress, supplements, anxiety, and sleep information, and accessed the resources provided on this topic. They noted that their "personal favorites were the nutrients and the psychology, and then managing life after athletics." Likewise, one athlete stated that they did not expect to see information regarding "anxiety and depression and sleep, and life after graduation. I didn't think it was going to be so broad."

Suggestions for Improvement. The athletes and administrative staff were able to offer suggestions for improvements to the program. Some suggestions were personal and based on their own experiences. For example, one athlete stated that the eating disorder module was the least valuable to them as it is not something that they have experienced, while another noted that they did not need information about appropriate weight gain in their sport.

The participants also mentioned topics that they would have appreciated more information about, including meal planning, body composition, life after athletics, and general nutrition. In addition, they noted that they would like to know more about additional resources that are available on campus.

In terms of program design, one athlete suggested having a voiceover on some of the PowerPoint presentations to offer additional explanation on the topic. Another suggested that the staff ensure that all the answers were available to the module quizzes. While one athlete appreciated that the module content was released slowly over a 30-day period, another athlete

would have liked the information to be "released a little bit faster, because I don't have a lot of free time, and when I did, I would have liked to knock them all out at once."

One athlete noted that they would have benefitted from having this information during their first semester at college, as opposed to the second.

Reaching out to the RDN. All participants stated that the modules increased their awareness of the role and accessibility of the sports registered dietitian/nutritionist (RDN) who works with athletes on campus. If they have a specific nutrition related question, they would be willing to reach out to the RDN for guidance. In particular, one athlete mentioned that, because meal planning was an individualized task, they would reach out to the RDN for guidance. While marketing the program, the RDN reached out to the various teams on campus. One athlete noted that being able to see the RDN made them more willing to reach out to this on campus resource.

Changing Habits. After completing the modules, the participants recognized various areas of health and wellness in which they could make improvements. The administrative staff commented, "I know you're curious if I've changed any of my own habits, and the answer is yes I have. I have tried to do more in terms of fruits and vegetables, which I've known for a long time are good ideas, but this helped reinforce it."

One athlete noted that their awareness of ways to manage stress/anxiety, and the importance of sleep improved. Another athlete commented that while they did not change nutrition habits, in regard to stress and sleep, they were "more conscientious about that and getting a good night's rest, stretching, and trying to manage my anxiety by not just running and studying and sleeping."

Increasing Participation. While all three participants who we spoke with completed all 10 modules, they were able to offer suggestions for improved participation from all athletes on campus. The athletes were informed about the program by the RDN and their coaches. Both athletes had coaches who encouraged them to complete the modules as the incentive provided snacks for the team. This athlete stated, "We'll do anything for free food." Both athletes were aware of the snack incentive.

One coach also followed up periodically, asking if the athletes had completed the modules. This athlete stated that this more personal approach worked better for them. If they had only received an email to inform them of the program, they would have been less likely to complete it. Two participants agreed that prompting from a coach would likely improve the athletes' participation. "If coaches get behind it, you'll get more participation."

An additional recommendation from all three participants was to make the module completion into a competition. "Honestly, if you mentioned any sort of competition, even if it's just bragging rights, I think students are going to want to beat the other team."

Discussion and Implications for Campus Level Programming

This program delivered an online nutrition and mental health education course to a group of division-1 student-athletes via an interface of a smartphone app and website. There was a notable disparity between the number of overall participants and participants who completed the course modules where data was collected. Although we would have preferred complete participation, there is some nuance for future researchers to consider. Data suggest overall that students tend to prefer and perform better with in-person interactions and experiential learning opportunities. An online education component of a sports nutrition program offers some unique benefits but lacks the depth of educational experiences and structure to engage all target student-athletes.

In general, comments regarding the program content, accessibility, and delivery were positive. The participants appreciated the holistic content, and ability to access additional reputable resources on a topic.

It should also be noted that the survey data was collected via e-mail when participants reached certain points in the program. Another explanation for poor survey completion in this study could be that e-mail survey collection was a poor choice for distribution. Better participation might have been achieved if the surveys were housed within the app and available within the lessons. Perhaps because the program was delivered via app, and not the same mode of delivery that student-athletes receive for classes (I-Learn and e-mail), students were more likely to respond to a program that did not compete in the same channel as coursework and university communications.

The most ready-to-use implication of this program is the content and delivery of this education program. Other institutions can use these materials to assess and screen their student-athletes and deliver a virtual nutrition and mental health education course. Sports medicine, strength coaches, and dietitians are likely most suited to construct and deliver such a program to their athletics program. If the coordinator for a program like this lacks education and content delivery or development, they may seek to collaborate with their education and psychology departments on campus. The app was created with a platform made for dietitians (Healthie) and among the ability to host educational content in the described program, it offers a method for dietary surveillance, telehealth appointments with the dietitian, and some additional features that give a well-rounded package to sports nutrition initiatives. The Healthie app allowed the researchers to release a portion of each module each day, which most participants appreciated.

In order to increase participation, participants suggested a competition between various teams, coach encouragement, and an overview of the program from the registered dietitian/nutritionist, or others who deliver the program on campus.

References

Armstrong, S. N., Burcin, M. M., Bjerke, W. S., & Early, J. (2015). Depression in student athletes: A particularly at-risk group? A systematic review of the literature. *Athletic Insight, 7*(2), 177–193.

Cervero, R. M. (1984). Evaluating workshop implementation and outcomes. In T. J. Sork (Ed.), *Designing and implementing effective workshops: New directions for continuing education* (pp. 55–67). San Francisco: Jossey Bass.

Choose Myplate. Retrieved from https://www.choosemyplate.gov/

Denzin, N. K., & Lincoln, Y. S. (Eds.). (2013). *The landscape of qualitative research (3rd ed.)*. Los Angeles, CA: SAGE.

Driller, M. W., Mah, C. D., & Halson, S. L. (2018). Development of the athlete sleep behavior questionnaire: A tool for identifying maladaptive sleep practices in elite athletes. *Sleep Science, 11*(1), 37–44.

Gallegos, D., Ramsey, R., & Ong, K. W. (2014). Food insecurity: Is it an issue among tertiary students? *Higher Education, 67*(5), 497–510.

Karpinski, Christine A, Dolins, Karen Reznik, and Bachman, Jessica. (2019). Development and validation of a 49-item sports nutrition knowledge instrument (49-SNKI) for adult athletes. *Topics in Clinical Nutrition, 34* (3) (2019): 174-85.

Kroenke K., Spitzer R. L., & Williams J. B. W. (2001). The PHQ-9: Validity of a brief depression severity measure. *Journal of General Internal Medicine, 16*, 606-–613.

Kroenke K., Spitzer R. L., Williams J. B. W., Monahan P. O., & Löwe B. (2007). Anxiety disorders in primary care: Prevalence, impairment, comorbidity, and detection. *Annals*

of Internal Medicine, 146(5), 317-–325. [also includes additional validation data on GAD-7 and GAD-2]

Linfield, K. J., & Posavac, E. J. (2018). *Program evaluation: Methods and case studies* (9th ed.). Routledge.

McNulty, K., Adams, C., Anderson, J., & Affenito, S. (2001). Development and validation of a screening tool to identify eating disorders in female athletes. *Journal of the American Dietetic Association, 101*(8), 886-–892.

National Collegiate Athletic Association. (2021, June 8). Mental Health. https://www.ncaa.org/sport-science-institute/mental-health

NCAA GOALS Study. (2020). GOALS (growth, opportunities, aspirations and learning of students in college) study. NCAA Sport Science Institute. Retrieved from https://ncaaorg.s3.amazonaws.com/research/goals/2020AWRES_GOALS2020con.pdf

Parks, R., Helwig, D., Dettmann, J., Taggart, T., Woodruff, B., Horsfall, K., & Brooks, M. (2016). Developing a Performance Nutrition Curriculum for Collegiate Athletics. *Journal of Nutrition Education and Behavior, 48*(6), 419-424.e1.

Patton, M. Q. (2015). *Qualitative research and evaluation methods*. 4th ed. Los Angeles, CA: Sage.

Patton, M. Q. (2012). *Essentials of utilization-focused evaluation*. Thousand Oaks, CA: SAGE.

Patton-López, M. M., López-Cevallos, D. F., Cancel-Tirado, D. I., & Vazquez, L. (2014). Prevalence and correlates of food insecurity among students attending a midsize rural university in Oregon. *Journal of Nutrition Education and Behavior, 46*(3), 209–214.

Paul, M., Panton, C., & Marzigliano, N. (2008). Do students with healthy habits perform better in their academics? *Academy of Educational Leadership, 13*(2), 47–54.

Rubin, R. S. (2002). Will the real SMART goals please stand up? *The Industrial-Organizational Psychologist, 39*(4), 26–27.

Samuels, C., James, L., Lawson, D., & Meeuwisse, W. The Athlete Sleep Screening Questionnaire: A new tool for assessing and managing sleep in elite athletes. (2016).

Sanches-Diaz, S. Yanci, J. Castillo, D. Scanlan, A. Raya-Gonzales, J. Effects of Nutrition Education Interventions in Team Sport Players. A Systematic Review. (2020). Nutrients, 12(12), 3664. http://dx.doi.org.ezproxy.tntech.edu/10.3390/nu12123664

British Journal of Sports Medicine, 50(7), 418–422.

Shoemaker, Marni E, Gillen, Zachary M, McKay, Brianna D, Bohannon, Nicholas A, Mendez, Alegra I, and Cramer, Joel T. "Effects Of An Online Sports Nutrition Curriculum On Biomarkers Of Iron Status In Youth Athletes." Medicine and Science in Sports and Exercise 51.6S (2019): 892. Web.

Strauss A. L., & Corbin, J. (1990). *Basics of qualitative research: Grounded theory procedures and techniques*. Newbury Park, CA: Sage.

Sudano, L. E., Collins, G., & Miles, C. M. (2017). Reducing barriers to mental health care for student-athletes: An integrated care model. *Families, Systems, & Health, 35*(1), 77–84.

Thomas, D. T., Burke, L. M., & Erdman, K. A. (2016) Nutrition and athletic performance. *Medicine and Science in Sports and Exercise, 48*(3), 543–568.

Trockel, M. T., Barnes, M. D., & Egget D. L. (2000). Health-related variables and academic performance among first-year college students: Implications for sleep and other behaviors. *Journal of American College Health, 49*(3), 125–131.

Understanding Dietary Supplements. (2013). Retrieved from http://www.ncaa.org/sites/default/files/Understanding%20Dietary%20Supplements%20Fact%20Sheet.pdf

United States Department of Agriculture. (2017). Survey Tools. https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/survey-tools/#six.

Appendices

Appendix 1-Sample Lesson Plan

Food for Thought- Lesson Plan

Lesson #	**1**	
Lesson Title:	**Nutrition, An Overview of Quality**	
Lesson Duration:	**30 minutes**	

Lesson Objectives:
1. Name the six major classes of nutrients (macro- and micronutrients). a. List the six nutrients contained in food and a major use of each nutrient. 2. Create a MyPlate plan from choosemyplate.gov.

Summary of Tasks / Actions:
1. Watch Powerpoint 2. Explore Choosemyplate: create a MyPlate plan. 3. Review Start Simple with MyPlate app. 4. Pre-test

References:
http://www.choosemyplate.gov http://www.fda.gov

Take Home Tasks:

1. Based on the MyPlate calorie recommendation and suggestions from this site, create a 3-day meal plan.
    - 2 weekdays and 1 weekend
    - Must contain at least one meal from each area:
        - Cafeteria on campus
        - A restaurant you like
        - At home
2. Quiz

Appendix 2-Sample PowerPoint