PHYTORX: AN INTERDISCIPLINARY NUTRITION LEARNING MODULE

by

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ABSTRACT

CHERYL GRANILLO. PhytoRx: An Interdisciplinary Nutrition Learning Module. (Under the direction of LAURA MAGENNIS)

There is a long history of limited nutrition education in advanced healthcare curricula. This leaves healthcare providers unprepared to use nutrition to treat diagnoses that have been shown to respond to dietary intervention. A Mediterranean diet rich in phytochemicals can be used to prevent and treat a variety of medical illnesses. Phytochemicals are compounds found in plants that are biologically active in humans. Scientists have found that the pathways the phytochemicals take in the body are often similar to pharmaceutical pathways.

The purpose of the project was to improve healthcare professional students' understanding of the role of food in improvement of health outcomes and develop their confidence in this role by instructing students on phytochemicals and nutrition and their relationships to health outcomes. The project question was: for interprofessional students in a healthcare-centered professional program of study, can a short course in focused nutrition increase knowledge and confidence and improve attitudes about sharing nutrition-based counseling, compared to their pre-assessment data, when engaging with community clients? The term "PhytoRx" was adopted to convey the prescription of pertinent produce for diagnoses. "Phyto" refers to "phytochemicals" and "Rx" refers to "prescriptions" that match particular fruits and vegetables to particular disease processes.

The sample consisted of 17 students in master's programs in the social work and nursing fields with seven of those completing the program. Each student completed an eight module, asynchronous virtual training on the Mediterranean style of eating and phytochemical specific prescribing strategies. Participants completed a pre- and post-assessment evaluation with multiple choice questions gauging knowledge, Likert scale questions evaluating confidence, and

semi-structured, open-ended questions assessing attitudes toward implementing gained knowledge into practice. The module was self-paced and took approximately four hours to complete.

Data was collected from the module platform and entered into a spreadsheet and quantitative data was entered into SPSS for evaluation. Total pre- and post-assessment scores were recorded as well as before/after confidence questions and open-ended answers. Results showed the mean score for the pre-assessment was 60.39 (S.D.=14.12) and for the post-assessment was 65.58 (S.D.=9.32). The Wilcoxon Ranks Test shows significant improvement ($p<0.05$) for fifteen of the eighteen questions related to confidence in nutrition information. Open-ended attitude questions revealed that participants were interested in sharing the newly-learned nutrition information with community members and clients. Social work and nursing students may benefit from incorporating added nutrition education into their curricula. Further programming implementations in the area, including possible trial integration into curricula, are needed to further evaluate effectiveness.

Keywords: Prescription produce, healthcare curriculum, nutrition, phytochemical, Mediterranean diet

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DEDICATION

This work is dedicated to all of the inspirational nurses in my life. I am continually awed at the flexibility and power of nurses. I am learning so much.

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CHAPTER 1: INTRODUCTION

While the amount of nutrition- and diet-related information available to the public has grown substantially in recent years, there is still a pressing need to make nutrition training a focus of clinician education (Cassidy-Vu & Kirk, 2020). The deficiency of comprehensive coverage of nutrition education at the professional school level keeps medical students from developing robust confidence and skills when implementing nutrition related interventions with patients (Crowley et. al., 2019). When patients want to find information about what they should eat, they often have to search for that information in other places. The public is using Google, Pinterest, Facebook, TikTok and other internet sources and social media apps to get advice on how to change their diet to improve their health. Patients are seeking nutrition information more from social media and internet websites than healthcare providers (Bertrand et. al., 2021). This is due to inconsistent or lacking nutrition education in healthcare education curricula (Crowley et. al., 2019).

A 2010 study identified a wide range in the number of hours of nutrition education required in medical schools (Adams et. al., 2010). Although medical students and their professors had been asking for more nutrition education for decades (Adams et al, 2010), in 2010 there was a range of 0-70 hours (with an average of 19.6) of nutrition education in medical school curricula in responding schools (Adams et al, 2010). The quantity of hours of nutrition education is not the only concern. The quality of current nutrition education in medical schools is poor, which may be due to the lack of expertise and time commitment from faculty teaching these types of formal courses (Daley et. al., 2016). In 2020, Macaninch et. al. found that there was still a call to better implement nutrition into medical school curricula (Macaninch et. al., 2020). Medical students and physicians consistently rate their nutrition knowledge and the

sufficiency of their nutrition education low and their “perceived importance” of the same nutrition education high (Macaninch et. al., 2020).

Additionally, nurses have been asking for better nutrition related outcomes for patients for more than 70 years (Rynbergen, 1950). Even after a call to action in the 1950s (Rynbergen, 1950), nutrition curricula did not significantly change (Buxton & Davies, 2013). In 2013, Buxton and Davies found that about one third of nursing students self-reported their nutrition knowledge as “inadequate.” Even as late as 2022, there is evidence that there is still more education in nutrition needed in the graduate nursing curriculum (Chao et. al., 2022). Education in nutrition not only increases the knowledge of the learning nurse, but the confidence to share the new knowledge with patients (Boaz et. al., 2013).

Because the evidence shows that educating patients about nutrition in and out of the hospital setting is important to long-lasting nutrition behavioral changes and health outcomes, allied health workers, including pharmacists and social workers, need to be familiar with the function of nutrition in the treatment plan (Li et. al., 2021). Other health-related fields such as pharmacy and social work have noted the lack of nutrition literacy within their curricula (Cart. Et. al., 2022; Shor, 2010 ; Syed-Abdul, et. al., 2021). Abbreviated information not integrated well into the curriculum may not be enough for students to have the confidence to share nutrition information when they leave school (Machen et al, 2007). Education is not the only need. Providing guidelines, improving access to resources and improving collaboration between healthcare professionals may be keys to improving this problem (Arrish et. al., 2017; Dobson et. al., 2009; Mogre et. al., 2018).

1.1 Problem Statement

The increased struggle for food security makes good nutrition decisions even more difficult for a large part of the population in the United States (Savoie-Roskos, et. al., 2016). Expectations for what makes a "good choice" in relation to food and health can alienate community members (Andress et. al., 2020). Food prices, limited food access, and decreased access to healthcare support can leave people to make uninformed and inevitable choices in their diet that can be detrimental to their health (Chen & Antonelli, 2020). Potential patients/clients may seek an appointment to see a healthcare professional for symptoms related to these socially related decisions. Healthcare professionals cannot often make direct changes in the amount of access to food but may have influence in the way patients or clients access the food. It is crucial that healthcare providers take each window of opportunity to improve the health of their patients (Caldow et.al., 2022). Healthcare students lack sufficient nutrition education to be effective counselors for patients and clients (Devries et.al., 2019). Specific supplemental training may aid these clinicians in promoting healthy lifestyles and improved health outcomes. Since improvement is needed in the amount and structure of nutrition education in professional healthcare schools, a short, nutrition-based course can be provided to interprofessional students, including those in medical, nursing, and pharmacy programs, to improve understanding and confidence in this area (Persky, 2009).

1.2 Purpose of the Project

Patients have expectations of their healthcare team when it comes to their health. There is an expectation of knowledge of the health-related subject matter, the confidence to act on that knowledge, and the attitude that is conducive to facilitating questions and answers from the patient. These expectations include all aspects of diagnosis and treatment including the role of food in improvement of health outcomes. The goal of this scholarly project was to determine

whether health professional students' knowledge, attitudes, and confidence could be improved with a short nutrition course.

This project, "PhytoRx," was an online, didactic instructional program for health professional students at the University of North Carolina Charlotte about the Mediterranean diet and the effect of phytochemicals and nutrition on the body and their relationships to health outcomes. "Phyto" refers to "phytochemicals" which are compounds found in plants. Plants synthesize these chemicals in response to oxidative stress from the environment (Molyneux et.al., 2007). The chemicals help protect the plant from cellular damage that can occur as a result of prolonged exposure to oxidation (Molyneux et.al., 2007). These chemicals can often be seen as the signature pigments found in fruits and vegetables. For example, the blue pigment in blueberries is a phytochemical in the polyphenol family (Kay et. al., 2022) and the orange pigment of a carrot or pumpkin is in the carotenoid family (Dias et. al., 2021). Many of these compounds have been found to have human health related benefits.

The "Rx" part of the title of the program refers to "prescriptions" that match particular fruits and vegetables to particular disease processes. Anthocyanins are polyphenols that work in the blood stream to curb postprandial blood sugar elevation (Cremonini et. al., 2022). Blueberries are a fruit with particularly high levels of some anthocyanins (Kay et. al., 2022). Therefore, blueberries can be an ideal addition to the diet of someone who has chronic diseases such as metabolic syndrome and type 2 diabetes. The student participants in this virtual instruction on this nutrition information. The information was presented in a way that the students could then promote nutrition education and fruit and vegetable "prescriptions" with the clients that they were serving.

An online platform was chosen for this project such that it would be easily accessible to a variety of schedules of participants. The global COVID 19 pandemic also imposed the need for a virtual system of instruction. Online learning is often preferable to students because it gives students the flexibility to study at their own pace and in their chosen environment (Purwanto, 2020). The virtual structure of the program has been shown to be effective in the health-based sciences (Lindell et. al., 2006). Students show greater understanding of nutrition information taught as part of a larger curriculum during graduate level instruction (Kohlmeier et. al., 2000). Nutrition education can also be effective if taught in post-graduate residency/internship programs that have a specialized focus and can incorporate nutrition into that specialty (DeLegge et. al., 2010).

1.3 Clinical Question

In order to affect health outcomes in patients, members of the healthcare team should be familiar with foods and their effects on the body, and should have the assurance to use this information with patients and clients. The clinical question for this project was centered on whether an extracurricular learning plan can augment traditional learning to provide students with a strategy to elevate confidence and knowledge in nutrition information. The following PICOT question was used to evaluate the implementation of an educational program for interprofessional students: For interprofessional students in a healthcare-centered professional program of study (P), can a four- to six-week (T) online module or course in focused nutrition (I) increase knowledge and confidence and improve attitudes about sharing nutrition-based counseling (O) compared to their pre-assessment data (C) when engaging with community clients?

1.4 Project Objectives

The aim of the PhytoRx project was to supplement the didactic knowledge that students were gaining in their health-related field, with practical ways to use nutrition to boost the health of clients. The intervention worked with an online modular platform to share structured nutrition education and give further resources for the students to share with clients. The desired outcomes of the project were expanded knowledge of nutrition, improved confidence in the ability to counsel others using the knowledge, and positive attitudes about nutrition information for master's degree students from several disciplines in the College of Health and Human Services at University of North Carolina Charlotte (UNCC). The structure of the processes that were involved in this project include determining the level of knowledge that students currently have on the topic of healthy nutrition and evaluating learners' improvement through a post-assessment and a survey. The desired long-term outcome, although beyond the scope of this project, is to empower the interdisciplinary healthcare team to elevate the nutrition knowledge and health of patients by improving knowledge, attitudes, and confidence when counseling about nutrition.

CHAPTER 2: LITERATURE REVIEW

The literature review was conducted over a four-month period in October 2021 and February 2022. The search included the CINAHL and PubMed databases. Included terms were: *medical students*, *pharmacy students*, *nursing students*, *social work students*, *nutrition education*, *nutrition literacy*, and *food literacy*. Exclusions to the search included: journals published in a language other than English, and studies where the learners were children.

The literature review revealed that there was a discrepancy between the value of nutrition education for professional students and the amount of nutrition education they received (Bassin, 2020; Buxton, 2013; DeLegge, 2010). There has been a waxing and waning of interest in nutritional knowledge as it relates to medical school education over the past 100 years, but the faculty constructing long-term curriculum requirements at professional schools have not made nutrition a permanent and required subject (Committee on Nutrition in Medical Education, 1985; Devries et. al., 2019; Frankle et. al., 1972). Even as there are no uniform criteria for nutrition education in medical schools, the research supports improvement in the nutrition education that student practitioners receive in training (Bassin, 2020).

As far back as 1950, there are published accounts of the need for revised nutrition education in nursing schools (Rynbergen, 1950) but some nurses have shown poor recognition of malnourishment and nutrition status in general (Buxton, 2013). Social workers tend to focus more on psychosocial aspects of a client's health rather than nutrition issues showing a need to decrease barriers to improved nutrition knowledge for social workers (Shor, 2010). Pharmacy students recognized a need for additional nutrition education and its importance in their field of study (Syed-Abdul, et al, 2021). Confidence in current ability to provide nutrition counsel to

patients is low (Douglas et. al., 2019) and few pharmacy schools have been addressing public health needs within the curriculum (Lenz et. al., 2007).

Because of the long-standing paradigm of how each profession structures its curriculum, there is resistance to change to incorporate curriculum shifts. This means that students may continue to fall short in the knowledge and confidence in nutrition that could help the patients that they serve. Patients show improved clinical outcomes and fewer overall visits in primary care when interprofessional groups are used in treatment (Rock & Cooper, 2000). The interprofessional healthcare team has a unique opportunity to utilize nutrition in the different, specialized fields that make up total patient care after the individual professions have identified nutrition competencies within (DiMaria-Ghalili et. al., 2014).

Pre- and post- assessments have been determined to be effective when analyzing outcomes in a nutrition education intervention with adults (Pem et. al., 2016). Pre- and post-testing evaluated effectiveness of nutrition instruction and improvement in attitudes and confidence of students when using the information. Lindell et. al., (2006), showed that virtual instruction of nutrition information is effective in the health-based sciences. Students show understanding of information taught as part of a larger curriculum during graduate medical instruction (Lindell et. al., 2006). Nutrition education can also be effective if taught in post-graduate residency/internship programs that have a specialized focus and can incorporate nutrition into that specialty (DeLegge, 2010).

Augmenting current knowledge with nutrition information works toward actualizing the Quadruple Aim in healthcare. The first goal of the Quadruple Aim seeks to improve the health of the population (Arnetz et. al., 2020). Foods and their components can be used to treat and prevent illness in patients at risk for chronic disease (Shi et. al., 2022). The second Aim

addresses the healthcare experience for the patient (Arnetz et. al., 2020). Patients report higher rates of satisfaction when there is more communication with healthcare providers and staff (Navarro et. al., 2021). Part of implementing nutrition education and treatments into patient care is highlighting good communication with patients. The third aim notes the importance of keeping costs of healthcare under control (Arnetz et. al., 2020). Healthy diets can cost $1.50 more per day (Rao et. al., 2013), but can save healthcare dollars in prevention (Kris-Etherton et. al., 2014). Finally, the fourth part of the Quadruple Aim looks to improve the healthcare provider experience. Healthcare providers want to be able assess and implement changes to treatment plans quickly in the patient visit (Beasley et. al., 2020). With increased base knowledge, healthcare providers can have more flexibility to adjust patient treatments.

The aim of the PhytoRx project is to reinforce the didactic knowledge that students were gaining in their home institution with practical ways to use nutrition to boost the health of clients. The proposed intervention would work into the current academic education and give further resources for the student to share with clients. The desired outcomes of the project were expanded knowledge of nutrition, improved confidence in the ability to counsel others using the knowledge, and positively changing attitudes about nutrition information. The structure of the processes that were involved in this project include determining the level of knowledge that students currently have on the topic of healthy nutrition by using a pre-assessment methodology, constructing and implementing an education framework and lesson plan by using a virtual training program, and evaluating learners' improvement through post-assessment and focus group methodology. The long-term desired outcome, although beyond the scope of this project, was to empower the interdisciplinary healthcare team to elevate the nutrition knowledge and

health of patients by improving knowledge, attitudes and confidence when counseling about nutrition.

CHAPTER 3: METHODOLOGY

The original participant pool was a group of interdisciplinary healthcare students in the "Beyond Clinic Walls" program. "Beyond Clinic Walls" (BCW), in Asheville, North Carolina, is an extracurricular program that brings students from different home schools and programs of study (medicine, nursing, pharmacy, and social work) together to help community clients navigate their healthcare journey focusing on the social determinants of health (Reyes & Moore, 2022). The BCW program uses the interdisciplinary team approach to advocate for their clients' best outcomes. Due to the time involved to complete the program, the BCW student leaders withdrew the group's participation in the PhytoRx project. Because the project was already approved by UNCC IRB, the protocol was adjusted and resubmitted to IRB.

3.1 Exclusion Criteria

Final inclusion criteria were students enrolled in one of the following programs: UNCC Master of Science in Nursing (MSN) (including nurse practitioner students), Master in Social Work (MSW), and Applied Physiology Students. Students invited to participate in the intervention were eligible if they were enrolled in the program in the fall semester of 2022. All students from each listed degree program were invited to participate regardless of experience. Students excluded were those who were not participating in one of the above listed programs, do not have access to the learning platform, Moodle, or the internet or those who were unwilling to complete the online educational nutrition program (PhytoRx).

3.2 Intervention

The intervention consisted of a pre-assessment, an educational intervention, and a post-assessment. The pre-assessment and post-assessment were identical nutrition-based information directly from the learning modules. They assessed knowledge using questions from the General

Nutrition Knowledge Questionnaire (GNKQ) (Kliemann et. al., 2016) (See Appendix A). The GNKQ is an open-sourced, reliable, and validated assessment tool which assesses attitudes and confidence related to the nutrition content (Kliemann et. al., 2016). Attitude questions used a Likert scale to record changes in how willing students were to change their learning style to include nutrition information. This Likert scale was drawn from the widely used nutrition education program "MED Instead of Meds" (The Science of MED, 2018). Confidence questions also used a Likert scale and recorded changes in the confidence level that students had with using the nutrition information as they counsel clients in the future. Finally, open-ended questions were given to evaluate learners' opinions on module improvement and facilitated expression of participants' overall thoughts of the course.

This education intervention took the form of seven lessons delivered in an asynchronous virtual format via Moodle. Moodle is a virtual learning platform that allows students to navigate lessons within an online class. The instructor has access to the participation and evaluation of students that are enrolled in the Moodle class. Within this Moodle intervention, students had modular lessons available for several weeks and were able to access the lessons at their own pace.

The content consisted of the "MED Instead of Meds" curriculum with additional up-to-date, evidence-based nutrition information (The Science of MED, 2018). "MED Instead of Meds" is an evidence-based Mediterranean style eating pattern program with seven basic lessons (The Science of MED, 2018). The students were taught the lessons in this order: *Change Your Protein, Swap Your Fats and Snack on Nuts and Seeds, Eat More Vegetables & Eat More Fruit, Make Your Grains Whole, and Rethink Your Sweets* (The Science of MED, 2018). The final lesson incorporated research on phytochemicals in the diet that can modify disease.

Each lesson consisted of a narrated PowerPoint slide deck and video cooking demonstrations. Resource elements were available for the students. The General Nutrition Knowledge Questionnaire (GNKQ) is an open-access, validated nutrition knowledge tool (see APPENDIX A) (Kliemann et. al., 2018). There were some small modifications made to the GNKQ tool for cultural understanding. These modifications were not validated with the original text of the tool. The GNKQ tool was administered electronically within the Moodle platform as the pre-assessment. The results were collected through Moodle and transferred to a Microsoft Excel spreadsheet to a pre-assigned participant number corresponding to the participant's name. After the allotted intervention time, the same GNKQ tool was used as the post-assessment. The confidence tool used came directly from the MED Instead of Meds program evaluation survey (see APPENDIX B). Opinions about improvement of the program and notable changes in practice (Attitudes) were noted through open-ended questions (see APPENDIX C). All identifiable data was saved in a separate, password protected file from the raw and aggregate data.

3.3 SWOT Analysis

A SWOT analysis structure can help to anticipate problems that could disrupt the flow of the project. The most compelling strength to this project was the data behind the need for improved nutrition education. Students in science specialties can identify with science literature. A notable weakness was that, in this time of COVID-19, some students have become fatigued with the online learning platform (de Oliveira Kubrusly Sobral et. al., 2022). However, online learning has been shown to be effective and engaging in students of this level (Nazmi et. al., 2019; Whatnall et. al., 2019). The long-term goal of this project was to have an ongoing program for masters prepared allied health science students, as there was no competing program in the

area. There could be some resistance to a new way of presenting healthy nutrition from students or the clients that they serve, however.

3.4 Marketing Plan

Because any project that requires participants to contribute time and concentration can cause a learning fatigue as stated in the SWOT analysis, it was important to frame the benefits for the stakeholders. It is crucial to have the backing of both the facilitators of the master's degree programs and the students that were participation. The participants sought were the clinician students in three interdisciplinary fields: nursing, social work, and applied physiology. Each group has a separate focus but a similar goal of helping clients realize community potential. Their feedback and participation were important to evaluate and improve the elements of the project.

At the beginning of enrollment in October 2022, a welcome email was sent to faculty to send to students in their programs. Potential participants were directed to a Google form where they could read about the project and provide their consent. The project was outlined, highlighting the evidence-based need for improved nutrition education for professionals in healthcare as well as the benefits to their current clients. Tools and deliverables were developed to aid in the implementation of the nutrition education to clients according to the needs and preferences of these stakeholders. These included cooking tools and "PhytoRx" prescription pads. Follow-up emails were sent with a link to the Moodle platform for participation. Throughout the semester, reminder emails were sent to students to encourage use of the modules and to take the pre- and post-assessments.

3.5 Measurement Tools

Finding and using a valid and appropriate measurement tool can often be a challenge. A straightforward tool that is efficient and effective in capturing the desired data can be the key to successfully evaluating an intervention. Because this project aimed to gain insight on knowledge gained as well as changes in attitudes and confidence, two distinct tools were used to collect data as well as semi-structured open-ended questions.

The tool used to evaluate the pre- and post-program knowledge of the students participating in the intervention was the revised General Nutrition Knowledge Questionnaire (GNKQ) (See Appendix A). This is an open-use tool. This questionnaire has been used with many diverse populations since the 1990s, but has been revised and revalidated in 2016 to reflect the evolution of nutrition recommendations (Kliemann et. al., 2016). The PhytoRx program included pages one through ten and had modified demographic questions to include the type of education program and previous nutrition experience or classroom study.

The MED instead of Meds program has been successfully evaluating changes in confidence and attitudes using their own tool which is open-access in North Carolina. Because the PhytoRx program is based heavily on the MED instead of Meds program, this tool was used (See Appendix B) (The Science of MED, 2018). Data was transferred to Microsoft Excel from Moodle. Data was then moved to SPSS for analysis.

3.6 Data Analysis Plan

Descriptive statistics and the non-parametric Wilcoxon Signed Ranks Test were used to in evaluation of this project because of the small number of participants (n=7). The GNKQ and the MED Instead of Meds tools were used to collect data. Data was collected in a Google document where it was also de-identified.

3.7 Confidentiality Protocol

All identifiable data was saved in a separate, password protected file from the raw and aggregate data. These files were destroyed upon the completion of the project. Care was taken to treat all personal and identifiable information in a discreet manner. This data was not provided when reporting results or when presenting aggregate data. The data from this study was not used for future research.

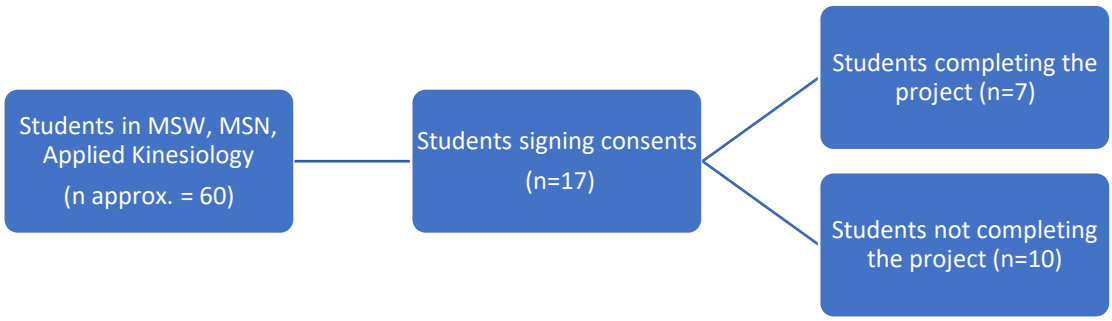
The Moodle platform was password protected and followed the confidentiality protocols of North Carolina State University. Once all data was collected and analyzed, any Moodle accounts containing information connecting student names to responses was deleted. No identifiable responses were used when reporting or presenting data or results. This project was approved by the UNCC Institutional Review Board (record number IRB-22-1141).

CHAPTER 4: RESULTS

4.1 Participants

Approximately 60 graduate students were approached by email to participate in the PhytoRx project. Of these, 17 students [ten from the Master of Social Work (MSW) program, five from the Master in Nursing (MSN) program, and two from the Kinesiology program] consented to participate via the electronic consent process. One student gave an invalid email address, and one student had an illness that left them unable to complete the work. Seven of the remaining fifteen students completed the modules of the project, including the evaluation (see Figure 1).

Figure 1.
Matriculation of participants.



Due to the small number of participants completing the entire intervention (n=7), descriptive statistics were used to evaluate changes in the data from the pre-assessments, post-assessments, and the confidence evaluations using SPSS. Social work students comprised 85.7% of completers (6 out of 7) and 14.3% were nursing students (1 out of 7). There were no applied physiology students that completed the program.

4.2 Knowledge Results

The General Nutrition Knowledge Questionnaire (see Appendix A) was used for both pre- and post-assessment. The mean score for the pre-assessment was 60.39% (S.D.=14.12) and for the post-assessment was 65.58% (S.D.=9.32). Not only did the mean score improve about five percentage points, but the standard deviations also decreased by about five showing that the scores tightened up around the mean. The median score also increased from 61.36 to 65.91 percent. See *Table 1* for descriptive statistics comparing the pre-assessment scores to post-assessment scores.

Table 1.
Descriptive Statistics related to Knowledge: Pre- and Post-assessment Scores.

		Pre-assessment Score	Post-assessment Score
N	Valid	7	7
	Missing	0	0
Mean		60.3886%	65.5829%
Median		61.3600%	65.9100%
Std. Deviation		14.12241	9.31773
Range		45.45	25.00
Minimum		31.82	52.27
Maximum		77.27	77.27

Three MSW students had dramatically different changes in their knowledge scores affecting the total mean. One score increased by over 20 points. This participant noted having one to two classes in nutrition in their degree program and was in year 5+ in their degree program. Only one other participant in the project, a nursing student, noted having any experience with nutrition through classes in their degree program. Another MSW participant's score decreased by a little over two points, had no nutrition classes in their program, and was in year four of their degree program. A third participant's score stayed the same from pre- to post-

assessment, had no nutrition classes in their program, and was in year two of their degree program.

Both the highest and lowest scores on pre- and post-assessment were social work students. The participant with this largest increase in post-assessment score reported having the most years in their professional program. Two participants selected that they had had one to two nutrition classes as part of their professional program, one from the MSW program and one from the MSN program. The other five participants recorded that they had taken no nutrition classes as part of their professional program.

A non-parametric, Wilcoxon Signed Ranks test was run on the pre-assessment and post-assessment raw scores from the GNKQ (see *Table 2)*. With this statistical test, if the Z value is less than -1.96 or greater than 1.96, the null hypothesis is to be rejected. Although the descriptive statistics show improvement in the mean scores, because the Z value here is -1.80, the null hypothesis cannot be rejected. It is possible that the difference in the pre-assessment score and the post-assessment score change could have happened by chance.

Table 2.
Wilcoxon Signed Ranks Test related to Knowledge- Pre- and Post-assessment.

	Post-assessment Score – Pre-assessment Score
Z	-1.802[b]
Asymp. Sig. (2-tailed)	.072

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

4.3 Confidence Results

The 18 confidence questions were included to assess confidence concerning different topics within the Mediterranean style of eating and phytochemical use in the diet. Participants

rated their confidence on a scale of one to five with one being very low confidence and five being very high confidence. Of all eighteen questions, there was a mean increase in confidence of 1.34 points (S.D.=0.40) on the five-point scale.

Participants rated their highest change in confidence when appraising their "knowledge of the strategies for implementing the MED way of eating in daily life." Five out of six of the MSW students increased their rating of their confidence on this question by two to four points. The other MSW student and the MSN student increased their rating of confidence by one point on this question. There was a mean total confidence increase of 2.14 points (S.D.=1.07). Participants rated their lowest change in confidence when answering the question "How confident were you in your ability to choose whole grain options?" There was a mean confidence increase of 0.71 points (S.D.=1.11). The overall mean change in rating for the confidence questions was 1.31 (S.D.=0.34).

A Wilcoxon Signed Ranks Test was performed to evaluate possible significance on the changes in confidence after completing the intervention (see Table 2). With the confidence data, the Z values for each of the confidence questions are less than -1.96 indicating that the null hypothesis should be rejected. This suggests that the changes in confidence are unlikely to show a chance relationship and are more likely attributed to the intervention. Over 80% of the confidence questions showed a p-value of less than 0.05, indicating that there was significant improvement in confidence scores after the program participation. Three of the 18 p-values were not significant (questions 4, 10, and 11).

Table 3.

Descriptive Statistics and Wilcoxon Signed Ranks Test related to Confidence: Before and After Course Scores.

Confidence Question	"Before taking this course" Mean	*S.D.*	"After taking this course" Mean	*S.D.*	Change in Mean	*S.D.*	Z*	Asymp. Sig. **
1. Please rate your knowledge of the Mediterranean-style eating pattern (i.e., the MED way of eating).	2.14	*0.90*	3.86	*0.69*	**1.71**	*0.95*	-2.26	*0.02*
2. Please rate your knowledge of the health benefits associated with the Mediterranean-style eating pattern (i.e., the MED way of eating).	2.71	*0.95*	4.29	*0.76*	**1.57**	*1.13*	-2.46	*0.01*
3. Please rate your knowledge of the strategies for implementing the MED way of eating in daily life.	2.00	*0.82*	4.14	*0.90*	**2.14**	*1.07*	-2.39	*0.02*
4. Please rate your knowledge of mindful eating.	2.57	*1.13*	3.86	*0.69*	**1.28**	*1.25*	-1.89	*0.06*
5. Please rate your knowledge of the strategies for implementing mindful eating in daily life.	2.43	*0.98*	3.86	*0.69*	**1.42**	*0.95*	-2.06	*0.04*
6. How confident were you in your ability to choose healthy proteins?	2.86	*0.90*	4.14	*0.69*	**1.28**	*0.76*	-2.25	*0.02*
7. How confident were you in your ability to use olive oil in cooking and food preparation?	3.14	*1.35*	4.43	*0.79*	**1.28**	*0.76*	-2.25	*0.02*
8. How confident were you in your ability to eat 5 serving or more of fruits and vegetables a day?	2.71	*0.76*	4.00	*1.00*	**1.28**	*0.49*	-2.46	*0.01*
9. How confident were you in your ability to include nuts and seeds in meals and snacks?	3.00	*1.15*	4.14	*0.90*	**1.14**	*0.69*	-2.27	*0.02*
10. How confident were you in your ability to choose whole grain options?	3.29	*1.11*	4.00	*0.82*	**0.71**	*1.11*	-1.52	*0.13*
11. How confident were you in your ability to limit the amount of added sugar you eat and drink?	3.29	*1.11*	4.14	*0.69*	**0.86**	*0.90*	-1.86	*0.06*
12. How confident were you in your ability to limit the amount of highly processed foods you eat and drink?	2.86	*1.07*	3.86	*0.90*	**1.00**	*0.82*	-2.07	*0.04*
13. How confident were you in your ability to use herbs and spices to flavor foods?	3.29	*1.11*	4.14	*0.90*	**0.86**	*0.69*	-2.12	*0.03*
14. How confident were you in your ability to plan healthy Mediterranean-style meals?	2.00	*1.29*	3.57	*0.98*	**1.57**	*1.27*	-2.23	*0.03*
15. How confident were you in your ability to utilize mindful eating strategies?	2.57	*0.98*	4.00	*0.58*	**1.42**	*0.98*	-2.23	*0.03*
16. How confident were you in your ability to plan meals?	2.29	*1.11*	3.71	*0.76*	**1.43**	*0.79*	-2.46	*0.01*
17. How confident were you in your ability to right-size your portion?	2.00	*1.00*	3.43	*0.53*	**1.43**	*0.98*	-2.23	*0.03*
18. How confident were you in your ability to read food labels?	3.00	*1.15*	4.14	*0.90*	**1.14**	*1.07*	-2.06	*0.04*

*Wilcoxon Signed Ranks Test

**Asymptotic significance displayed. The significance level is 0.05.

4.4 Attitudes Results

The third part of the evaluation of this project incorporated open-ended questions to assess participants' attitudes toward putting their new nutrition knowledge into practice (see Appendix D for a full list of questions and answers). Participants were asked to comment on: ways the program helped them or their clients prepare more healthy meals, skills learned, changes in overall health, the best part of the program, how the program could be improved, and how they would implement the program in their community.

When participants were asked to "share one or more ways that the program helped you or your clients prepare more healthful meals", several of the participants spoke about how they learned new knowledge about food choices, but also learned about the relationship they had with food. Participants specifically mentioned that they discovered new recipes that they felt were palatable and could be used to improve their health. One participant commented on the technique of mindful eating discussed in the learning modules. Participant ten stated, "I have been more mindful in my eating, not being on my phone or watching TV and focusing on how full I feel after eating".

The second open-ended question was "What was the most helpful skill you learned from this program?". Two of the seven participants, one MSW student and one MSN student, commented here about mindful eating. In particular, Participant ten commented that they felt much of the lessons about what to eat were "common sense" but that the mindful eating passages were new information. Two different participants, both MSW students noted that food labels were often confusing and they improved their skill in reading labels through the modules. Participant two, a social work student, stated that the most helpful skill was "[t]he difference in whole grains! I agree that labels can be so misleading, and there is much confusion at the grocery store. Reading labels is a big struggle and I feel more confident in my ability now."

All participants expressed that they learned about healthful changes they could make in their own diets. Participants noted that they learned more about whole grains, nuts and seeds, and reading food labels. Participant ten commented about gaining confidence in the skill of mindful eating and how it "impacts portion sizes, feelings around food, and satiety." Examples of ways that participants would share the program in their community were varied. One participant would "talk… with friends about the program" and others explained how they could incorporate this program into "church newsletters" and "Living Healthy" aspects of self-management programs already in use.

The third question in this attitudes survey was "Did your participation in this program correspond with any changes in overall health (e.g., weight loss, change in blood pressure, change in medication, etc.) for you or your client?". Four participants, three MSW students and one MSN student, commented that they noticed no changes yet, but were hoping to notice some changes as they changed their eating habits. Participant two noted that they had improved awareness of the need to control their blood sugar.

When asked, "What did you like best about the program?", three of the seven participants, two MSW students and one MSN student, mentioned the recipes that were integrated into the modules. Participant nine, an MSW student, responded, "I really liked the simple recipes, because a lot of recipes online are complicated and inaccessible." Participant ten also made a comment about the simplicity of the program and how manageable the information was to digest.

There were several practical suggestions when asked about how the program could be improved. Two of the participants wanted more of a variety of recipes with different cooking methods. Participant one wanted more teaching exercises included in the teaching methods.

Several participants were very specific with the ways that PhytoRx could be implemented in to the community. Two participants would put the information into written communication such as newsletters and brochures. Three other participants would implement the information into in-person programs in the community and occupational settings.

There were several key themes identified for improvement of the PhytoRx program. There was a recommendation that the PowerPoint presentations be shorter and less repetitive in their introductory slides and the recipes used to illustrate concepts within the presentations. One participant wanted more connections between diet and mental health to be able to share with their current clinic population.

Although not in a significant way, knowledge scores increased for nearly all participants. The confidence levels of the participants increased significantly in 15 or 18 of the evaluation questions. Participants provided detailed answers to the open-ended attitude questions that provided insight how participants experienced the program. The three parts of the evaluation of this project; knowledge, confidence, and attitudes, had significant or practical implications for practice.

CHAPTER 5: SIGNIFICANCE AND IMPLICATIONS

This project was intended to evaluate the change in knowledge, attitudes, and confidence of students in healthcare fields after completing a nutrition learning program. This program was not an essential or supplementary part of the curriculum in any of the fields investigated (social work, nursing, and applied physiology), but contained extracurricular information that was related to their field of study. In general, students improved their scores in all areas of knowledge and confidence and reported improvements in attitudes in the open-ended section of the evaluation. Participants expressed a positive learning experience after completion of the modules.

5.1 Discussion

Although the seven participants in this project did not show a statistically significant change in knowledge from pre-assessment to post-assessment according to Wilcoxon Signed Ranks Test, there are some preliminary conclusions that can be made. Because the mean and median scores of the participants improved and the range and standard deviation of scores decreased, this group of students showed improved nutrition knowledge. The virtual modules allowed for nutrition education to be transmitted in a way that was successful for these students. A larger sample would allow more extrapolation of data to a wider population.

The questions that evaluated confidence did show some statistically significant improvements on most of the questions. Overall, 15 of the 18 confidence questions showed improvement after participating in the intervention. In general, this project allowed for heightened levels of confidence by asking participants to think about how to apply their knowledge of nutrition. Of the three questions where there was no significant improvement in confidence according to the Wilcoxon Signed Ranks test, two questions had the highest initial

rating scores (along with one statistically significant data point). Students showed less change between this before and after rating. Although there were some comments in the attitudes section about how much students learned about whole grains (Confidence Question 10) and limiting sugar in the diet (Confidence Question 11), students seemed to rate themselves higher in confidence before taking the learning modules.

The qualitative data describing the changes in attitudes of the students in the project were some of the most specific results. Students reported positive knowledge gains along with learned ways to apply their learning to their own personal and professional lives. Participants expressed that they would use this nutrition information to find healthier habits to familial dietary habits while also looking into programming in local churches, health insurance case management programs, and community healthy living programs.

The open-ended attitude questions will also be used as suggestions for modifications in future programs. Because the evidence shows that students tire of virtual coursework (Purwanto, 2020) and participants in this project suggested shorter videos, a hybrid model could be developed to provide the flexibility of the online platform and the personability and dynamic content of an in-person presentation. Further recipes can be developed and incorporated into the modules to address the variety of comments about recipe simplicity and redundance. Specific evaluation of the format for the separate fields of study (social work vs. nursing etc.) should also be investigated because the level of scientific background is different among different professions. This will help address the comment that some of the content was “went over [the participant’s] head”.

5.2 Limitations

There were some important limitations to this project. The first was the low number of participants that completed the intervention and the evaluation process. Although improvement was seen on most questions that were monitored, more data should be collected in order to draw better conclusions about the effectiveness of the intervention.

According to Sheridan et. al. (2020), participants often seem to join and complete a study for a personal perceived benefit, out of kindness, or because of confidence or faith in the subject matter or entity that is performing the research. Students evaluating whether to participate in the PhytoRx project had to weigh what they saw as benefits to participation with the hindrance of a non-required time commitment. The demands of the course load, testing, proximity to graduation, and external and personal factors had influence in each prospective participant's probability of joining and then completing the project.

Another limitation of this project was the number of healthcare fields targeted. To be able to generalize results throughout healthcare education and practice, a greater variety of healthcare students and professionals should be involved in the project. Because primary care is progressing to a more team-based model of care (Mitchell, et. al., 2019), perhaps healthcare teams can be evaluated using a program like PhytoRx to assess the value of targeted nutrition education within an outcome-focused team.

Even when a particular field of study can be identified and targeted, if there is not a champion within the field to help encourage the success of implementation of nutrition content with colleagues and students, programming can stall (Lepre et. al., 2022). In this project, instructors in the three degree programs investigated were the vehicles for the initial recruitment

email. However, these instructors had no previous knowledge of the program and were not recruited as champions for PhytoRx.

5.3 Implications for Practice

Nutrition education is becoming more valued and commonplace, but there is a general lack of standardized requirements, which are common in other areas of healthcare training. When nurses, physicians, social workers, dentists, hygienists, and pharmacists take certification exams, they are expected to know and have retained a specific inventory of information. This information is the basis from which they will form their practice. There have been attempts to make regulatory changes that require nutrition to become part of that inventory (Expanding Nutrition's Role in Curricula and Healthcare Act, 113th Congress, 2nd session. 2014), but they have been met with resistance. The PhytoRx program fits this need by providing evidence-based nutrition didactic information as well as practical ways to incorporate the learned material into treatment plans that support improved patient outcomes.

Advanced practice nurses are in a prime position to provide patients with nutrition-based education and therapeutic treatment. Nurse practitioners have indicated that there is a need for more nutrition education to be incorporated into the nurse practitioner plan of study (Chao et. al., 2022). As policy concerning payment of provider services changes, there are possible avenues for implementing required health care provider and support staff training in nutrition. As electronic health records become more robust, practical, and user-friendly, they become better tools to capture patient education efforts that affect health.

There are also implications for practice in other healthcare fields. Because there are few nutrition questions on certification examinations, medical schools have little incentive to infuse the current medical school curriculum with intense nutrition content. There is also no accepted

specialty in nutrition by the American Board of Medical Specialties (Levy et. al., 2014). This means that physicians cannot put in extra work to become a part of a specialty that can bill for its services. There have been some moves to include more nutrition education into medical school education programs (Kris-Etherton et. al., 2014) but without widespread success. Because the average knowledge score before the program was 60.39%, there is a demonstrable need for imbedded nutrition education in curriculum. Due to the low participation, it is hard to say if a short course, like PhytoRx, would lead a desired amount of increased knowledge for a larger population, but this program did show some improvement for this sample.

5.4 Recommendations

This data showed that PhytoRx intervention helped social work and nursing student participants to improve their knowledge, attitudes and confidence with nutrition information used to improve health. However, the small number of volunteer participants and some of the answers to open-ended attitude questions demonstrate that students have to be very interested in content or the content has to be required for students to participate. Considering these two factors together led to three essential recommendations.

First, schools teaching students in health-related fields (nursing, social work, medicine, pharmacy, dentistry and hygiene, physical and occupational therapy etc.) should rigorously evaluate their curricula for treatment-based nutrition education. Schools need to understand how their current curriculum and system are treating nutrition education and where there is availability for addition classes to address the need. This needs assessment can be incorporated into other general curriculum review processes.

Second, evidence supports nutrition-based therapies for many chronic illnesses including cardiovascular disease, diabetes, and even mood disorders (Guo et.al., 2022; Martins et. al.,

2021). Students who are intending to treat or facilitate treatment in healthcare should know how to use nutrition to improve outcomes. Trial implementation and evaluation of coursework featuring nutrition treatments and how to access the treatments in the community, like PhytoRx, can help form the framework for future implementations and expansions of promising programs. Finally, policy related to standardizing nutrition didactic and practical opportunities in healthcare related education systems should be pursued. The full potential of integrated nutrition management in treating chronic and acute disease cannot be realized until a baseline nutrition curriculum is implemented in the places where people go to learn how to heal others.

5.5 Summary

Human disease can be prevented and treated with nutritional diet changes (Beasley et. al., 2020). Professionals who have the most exposure to patients should have significant knowledge of nutrition and how to use this knowledge to treat patients. Current healthcare curricula are lacking up-to-date, comprehensive, and effective nutrition education (Beasley et. al., 2020). There is often more of a focus on pharmaceutical interventions as opposed to nutritional ones (Koeder & Perez-Cueto, 2022). PhytoRx sought to bring a short nutrition course to healthcare professional students to enhance their field-specific coursework.

Nutrition education can be effective when implemented in an online format (Wilcha, 2020). Students in healthcare fields can improve their knowledge, attitudes, and confidence regarding nutrition intended to improve health. The student participants showed some possible increases in their knowledge of nutrition but showed more significant gains in their confidence of nutrition. More evaluation is needed to determine the how this kind of programming can be implemented most effectively within the different fields of healthcare. While there is a need for continued study to understand the best method for delivery and curriculum placement of

nutrition information in healthcare higher education, this project helped illustrate the effectiveness and potential applications of a virtual short-course in nutrition for healthcare students.

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APPENDIX A.

Knowledge Questions from General Nutrition Knowledge Questionnaire (GNKQ).

GENERAL NUTRITION KNOWLEDGE QUESTIONNAIRE

This is a survey, not a test. Your answers will help identify which dietary advice people find confusing. It is important that you complete it by yourself. Your answers will remain anonymous. If you don't know the answer, mark "not sure" rather than guess. Thank you for your time.

Section 1: The first few items are about what advice you think experts are giving us.

1. Do health experts recommend that people should be eating more, the same amount, or less of the following foods? (tick one box per food)

	More	Same	Less	Not Sure
Fruit	✓	☐	☐	☐
Food and drinks with added sugar	☐	☐	✓	☐
Vegetables	✓	☐	☐	☐
Fatty foods	☐	☐	✓	☐
Processed red meat	☐	☐	✓	☐
Wholegrains	✓	☐	☐	☐
Salty foods	☐	☐	✓	☐
Water	✓	☐	☐	☐

2. How many servings of fruit and vegetables per day do experts advise people to eat as a minimum? (One serving could be, for example, an apple or a handful of chopped carrots) (tick one)

2	☐
3	☐
4	☐
5 or more	✓
Not sure	☐

3. Which of these types of fats do experts recommend that people should eat less of? (tick one box per food)

	Eat less	Not eat less	Not sure
Unsaturated fats	☐	✓	☐
Trans fats	✓	☐	☐
Saturated fats	✓	☐	☐

4. Which type of dairy foods do experts say people should drink? (tick one)

Full fat (e.g. full fat milk)	☐
Reduced fat (e.g. skimmed and semi-skimmed milk)	✓
Mixture of full fat and reduced fat	☐
Neither, dairy foods should be avoided	☐
Not sure	☐

5. How many times per week do experts recommend that people eat oily fish (e.g. salmon and mackerel)? (tick one)	
1-2 times per week	✓
3-4 times per week	☐
Every day	☐
Not sure	☐
6. Approximately how many alcoholic drinks is the maximum recommended per day (The exact number depends on the size and strength of the drink)? (tick one)	
1 drink each for men and women	✓
2 drinks each for men and women	☐
2 drinks for men and 1 drink for women	☐
3 drinks for men and 2 drinks for women	☐
Not sure	☐
7. How many times per week do experts recommend that people eat breakfast? (tick one)	
3 times per week	☐
4 times per week	☐
Every day	✓
Not sure	☐
8. If a person has two glasses of fruit juice in a day, how many of their daily fruit and vegetable servings would this count as? (tick one)	
None	☐
One serving	✓
Two servings	☐
Three servings	☐
Not sure	☐
9. According to the 'eatwell guide' (a guideline showing the proportions of food types people should eat to have a balanced and healthy diet), how much of a person's diet should be made up of starchy foods? (tick one)	
Quarter	☐
Third	✓
Half	☐
Not sure	☐

Section 2: Experts classify foods into groups. We are interested to see whether people are aware of food groups and the nutrients they contain.

1. Do you think these foods and drinks are typically high or low in added sugar? (tick one box per food)

	High in added sugar	Low in added sugar	Not sure
Diet cola drinks	☐	✓	☐
Natural yoghurt	☐	✓	☐
Ice cream	✓	☐	☐
Tomato ketchup	✓	☐	☐
Melon	☐	✓	☐

2. Do you think these foods are typically high or low in salt? (tick one box per food)

	High in salt	Low in salt	Not Sure
Breakfast cereals	✓	☐	☐
Frozen vegetables	☐	✓	☐
Bread	✓	☐	☐
Baked beans	✓	☐	☐
Red meat	☐	✓	☐
Canned soup	✓	☐	☐

3. Do you think these foods are typically high or low in fibre? (tick one box per food)

	High in fibre	Low in fibre	Not Sure
Oats	✓	☐	☐
Bananas	✓	☐	☐
White rice	☐	✓	☐
Eggs	☐	✓	☐
Potatoes with skin	✓	☐	☐
Pasta	☐	✓	☐

4. Do you think these foods are a good source of protein? (tick one box per food)

	Good source of protein	Not a good source of protein	Not sure
Poultry	✓	☐	☐
Cheese	✓	☐	☐
Fruit	☐	✓	☐
Baked beans	✓	☐	☐
Butter	☐	✓	☐
Nuts	✓	☐	☐

5. Which of the following foods do experts count as starchy foods? (tick one box per food)

	Starchy food	Not a starchy food	Not sure
Cheese	☐	✓	☐
Pasta	✓	☐	☐
Potatoes	✓	☐	☐
Nuts	☐	✓	☐
Plantains	✓	☐	☐

6. Which is the main type of fat present in each of these foods? (tick one box per food)

	Polyunsaturated fat	Monounsat-urated fat	Saturated fat	Cholesterol	Not sure
Olive oil	☐	✓	☐	☐	☐
Butter	☐	☐	✓	☐	☐
Sunflower oil	✓	☐	☐	☐	☐
Eggs	☐	☐	☐	✓	☐

7. Which of these foods has the most trans-fat? (tick one)

Biscuits, cakes and pastries	✓
Fish	☐
Rapeseed oil	☐
Eggs	☐
Not sure	☐

8. The amount of calcium in a glass of whole milk compared to a glass of skimmed milk is: (tick one)

About the same	✓
Much higher	☐
Much lower	☐
Not sure	☐

9. Which one of the following nutrients has the most calories for the same weight of food? (tick one)

Sugar	☐
Starchy	☐
Fibre/roughage	☐
Fat	✓
Not sure	☐

10. Compared to minimally processed foods, processed foods are: (tick one)

Higher in calories	✓
Higher in fibre	☐
Lower in salt	☐
Not sure	☐

Section 3: The next few items are about choosing foods	
1. If a person wanted to buy a yogurt at the supermarket, which would have the least sugar/sweetener? (tick one)	
0% fat cherry yogurt	☐
Natural yogurt	✓
Creamy fruit yogurt	☐
Not sure	☐
2. If a person wanted soup in a restaurant or cafe, which one would be the lowest fat option? (tick one)	
Mushroom risotto soup (field mushrooms, porcini mushrooms, arborio rice, butter, cream, parsley and cracked black pepper)	☐
Carrot butternut and spice soup (carrot , butternut squash, sweet potato, cumin, red chillies, coriander seeds and lemon)	✓
Cream of chicken soup (British chicken, onions, carrots, celery, potatoes, garlic, sage, wheat flour, double cream)	☐
Not sure	☐
3. Which would be the healthiest and most balanced choice for a main meal in a restaurant? (tick one)	
Roast turkey, mashed potatoes and vegetables	✓
Beef, Yorkshire pudding and roast potatoes	☐
Fish and chips served with peas and tartar sauce	☐
Not sure	☐
4. Which would be the healthiest and most balanced sandwich lunch? (tick one)	
Ham sandwich + fruit + blueberry muffin + fruit juice	☐
Tuna salad sandwich + fruit + low fat yogurt + water	✓
Egg salad sandwich + crisps + low fat yogurt + water	☐
Not sure	☐
5. Which of these foods would be the healthiest choice for a pudding? (tick one)	
Berry sorbet	✓
Apple and blackberry pie	☐
Lemon cheesecake	☐
Carrot cake with cream cheese topping	☐
Not sure	☐

6. Which of these combinations of vegetables in a salad would give the greatest variety of vitamins and antioxidants? (tick one)	
Lettuce, green peppers and cabbage	☐
Broccoli, carrot and tomatoes	✓
Red peppers, tomatoes and lettuce	☐
Not sure	☐
7. If a person wanted to reduce the amount of fat in their diet, but didn't want to give up chips, which of the following foods would be the best choice? (tick one)	
Thick cut chips	✓
Thin cut chips	☐
Crinkle cut chips	☐
Not sure	☐
8. One healthy way to add flavour to food without adding extra fat or salt is to add: (tick one)	
Coconut milk	☐
Herbs	✓
Soya sauce	☐
Not sure	☐
9. Which of the following cooking methods requires fat to be added? (tick one)	
Grilling	☐
Steaming	☐
Baking	☐
Sautéing	✓
Not sure	☐
10. Traffic lights are often used on nutrition labelling, what would amber mean for the fat content of a food? (tick one)	
Low fat	☐
Medium fat	✓
High in fat	☐
Not sure	☐
11. "Light" foods (or Diet foods) are always good options because they are low in calories. (tick one)	
Agree	☐
Disagree	✓
Not sure	☐

The following questions are related to food labels:

Product 1 (Sweet biscuit)
Each biscuit (9.5g) contains:

Calories	Sugar	Fat	Saturates	Salt
43	2g	1g	1g	0.1g
2%	2%	2%	3%	2%

Typical value (as sold) per 100g: 450 Kcal

Ingredient list: Oat flakes, sugar, palm oil, fortified wheat flour, whole wheat flour, fructose, malt syrup, salt, raising agents: sodium hydrogen carbonate, ammonium hydrogen carbonate, flavouring

Product 2 (Savoury biscuit)
Each biscuit (16g) contains:

Calories	Sugar	Fat	Saturates	Salt
66	1g	3g	Trace	0.3g
3%	1%	4%	1%	4%

Typical value (as sold) per 100g: 412 Kcal

Ingredient list: Wheat Flour, Palm Oil, Corn Syrup, Malt, Salt, Yeast, Leavening Agents (Sodium Bicarbonate, Ammonium Bicarbonate, Sodium Pyrophosphate), Corn Starch, Soy Lecithin, Sodium Metabisulphite (Baking Agent).

12. Looking at products 1 and 2, which one has the most calories (kcal) per 100 grams (tick one)

Product 1	✓
Product 2	☐
Both have the same quantity	☐
Not sure	☐

13. Looking at product 1, what are the sources of sugar in the ingredient list? (tick one)

Sugar and malt syrup	☐
Sugar, fructose and lecithin	☐
Sugar, fructose and malt syrup	✓
Not sure	☐

Section 4: This section is about health problems or diseases related to diet and weight management	
1. Which of these diseases is related to a low intake of fibre? (tick one)	
Bowel disorders	✓
Anaemia	☐
Tooth decay	☐
Not sure	☐
2. Which of these diseases is related to how much sugar people eat? (tick one)	
High blood pressure	☐
Tooth decay	✓
Anaemia	☐
Not sure	☐
3. Which of these diseases is related to how much salt (or sodium) people eat? (tick one)	
Hypothyroidism	☐
Diabetes	☐
High blood pressure	✓
Not sure	☐
4. Which of these options do experts recommend to reduce the chances of getting cancer? (tick one)	
Drinking alcohol regularly	☐
Eating less red meat	✓
Avoiding additives in food	☐
Not sure	☐
5. Which of these options do experts recommend to prevent heart disease? (tick one)	
Taking nutritional supplements	☐
Eating less oily fish	☐
Eating less trans-fats	✓
Not sure	☐
6. Which of these options do experts recommend to prevent diabetes? (tick one)	
Eating less refined foods	✓
Drinking more fruit juice	☐
Eating more processed meat	☐
Not sure	☐

7. Which one of these foods is more likely to raise people's blood cholesterol? (tick one)	
Eggs	☐
Vegetable oils	☐
Animal fat	✓
Not sure	☐
8. Which one of these foods is classified as having a high Glycaemic Index (Glycaemic Index is a measure of the impact of a food on blood sugar levels, thus a high Glycaemic Index means a greater rise in blood sugar after eating)? (tick one)	
Wholegrain cereals	☐
white bread	✓
Fruit and vegetables	☐
Not sure	☐
9. To maintain a healthy weight people should cut fat out completely. (tick one)	
Agree	☐
Disagree	✓
Not sure	☐
10. To maintain a healthy weight people should eat a high protein diet. (tick one)	
Agree	☐
Disagree	✓
Not sure	☐
11. Eating bread always causes weight gain. (tick one)	
Agree	☐
Disagree	✓
Not Sure	☐
12. Fibre can decrease the chances of gaining weight. (tick one)	
Agree	✓
Disagree	☐
Not sure	☐

13. Which of these options can help people to maintain a healthy weight? (answer each one)

	Yes	No	Not sure
Not eating while watching TV	✓	☐	☐
Reading food labels	✓	☐	☐
Taking nutritional supplements	☐	✓	☐
Monitoring their eating	✓	☐	☐
Monitoring their weight	✓	☐	☐
Grazing throughout the day	☐	✓	☐

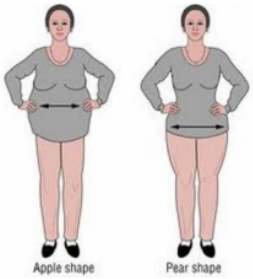
14. If someone has a Body Mass Index (BMI) of 23kg/m^2, what would their weight status be? (tick one)

Underweight	☐
Normal weight	✓
Overweight	☐
Obese	☐
Not sure	☐

15. If someone has a Body Mass Index (BMI) of 31kg/m^2, what would their weight status be? (tick one)

Underweight	☐
Normal weight	☐
Overweight	☐
Obese	✓
Not sure	☐

Look at the body shapes below:



16. Which of these body shapes increases the risk of cardiovascular disease (Cardiovascular disease is a general term that describes a disease of the heart of blood vessels, for example, angina, heart attack, heart failure, congenital heart disease and stroke)? (tick one)

Apple shape	✓
Pear shape	☐
Not sure	☐

APPENDIX B.
Confidence Questions from MED Instead of Meds.

MED instead of MEDS
medinsteadofmeds.com

Name: _____ Date of survey: _____
County: _____
Instructor: _____

Thank you for participating in the Med Instead of Meds class series. We hope you have enjoyed the program and have learned skills that you can use for a lifetime. We would like your help in evaluating this program. Your participation is voluntary. The purpose of this questionnaire is for us to learn how you did in the program, what you found useful, and how we can improve the program in the future. Survey results will be used for program evaluation and research. If you agree to participate, you will fill out this short questionnaire. This should not take longer than 15 minutes. The information you provide will be kept confidential. Reports about the results of this survey will not include your name or other identifying information. If you have any questions, contact Zandra Alford (919.513.2858, zaalford@ncsu.edu) at NC State University. If you feel you have not been treated according to the descriptions in this form, or your rights as a participant in research have been violated during the course of this project, you may contact Deb Paxton (919.515.4514), Research Administration, Box 7514, NCSU Campus (919.513.2148). I have read and understand the above information.

Participant's signature _____ Date _____

Instructor's signature _____ Date _____

Instructions: Please respond to the below questions after completing the Med Instead of Meds class series. Remember to complete the POST-Series Med Adherence Tool at this time as well.

EVALUATION SURVEY (COMPLETE *AFTER* CLASS SERIES)

1. Please rate your knowledge of the following:

	Before this program					After this program				
	very low	low	moderate	high	very high	very low	low	moderate	high	very high
The Mediterranean-style eating pattern (i.e. the Med Way of eating)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Health benefits associated with the Mediterranean-style eating pattern(i.e. the Med Way of eating)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Strategies for implementing the Med Way of eating in daily life	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Mindful eating	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Strategies for implementing mindful eating in daily life	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

NC STATE EXTENSION
Community & Clinical CONNECTIONS for Prevention & Health Branch NORTH CAROLINA DIVISION OF PUBLIC HEALTH
Eat Smart Move More NORTH CAROLINA

2. How confident were you in your ability to:

	Before this program					After this program				
	very unconfident	unconfident	neutral	confident	very confident	very unconfident	unconfident	neutral	confident	very confident
Choose healthy proteins	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Use olive oil in cooking and food preparation	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Eat 5 servings or more of fruits and vegetables a day	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Include nuts and seeds in meals and snacks	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Choose whole grain options	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Limit the amount of added sugar you eat and drink	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Limit the amount of highly processed foods you eat and drink	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Use herbs and spices to flavor foods	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Plan healthy Mediterranean-style meals	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Utilize mindful eating strategies	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Plan meals	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Right-size your portion	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Read food labels	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

APPENDIX C.

Open-ended Attitude Questions.

1. Please share one or more ways that the program helped you or your clients prepare more healthful meals.
2. What was the most helpful skill you learned from this program?
3. Did your participation in this program correspond with any changes in overall health (e.g., weight loss, change in blood pressure, change in medication, etc.) for you or your client? Explain.
4. What did you like best about the program?
5. How could the program be improved?
6. How would you share the program in your community?

APPENDIX D.
Attitude Questions and Answers.

Attitude Question	**Answer**
Please share one or more ways that the program helped you or your clients prepare more healthful meals.	*Being aware of food recipes that are healthy and yummy.*
What was the most helpful skill you learned from this program?	*The types of food substitutes there are.*
Did your participation in this program correspond with any changes in overall health (e.g., weight loss, change in blood pressure, change in medication, etc.) for you or your client? Explain.	*Not necessarily, a good refresher as somethings I forgot about.*
What did you like best about the program?	*The videos.*
How could the program be improved?	*Implement teaching exercises.*
How would you share the program in your community?	*At my internship.*

Participant 1

Attitude Question	***Answer***
Please share one or more ways that the program helped you or your clients prepare more healthful meals.	*This program helped me gain knowledge about myself as an individual and eat better. I feel more confident in educating people I know about eating better.*
What was the most helpful skill you learned from this program?	*The difference in whole grains! I agree that labels can be so misleading, and there is much confusion at the grocery store. Reading labels is a big struggle and I feel more confident in my ability now.*
Did your participation in this program correspond with any changes in overall health (e.g., weight loss, change in blood pressure, change in medication, etc.) for you or your client? Explain.	*It helped me learn that I need to control my blood sugar levels better.*
What did you like best about the program?	*I liked the questions throughout each module's presentation. It helped me remember what I was learning and the vital information.*
How could the program be improved?	*N/A*
How would you share the program in your community?	*I will educate others from what I learned. I would like to have more information so I am sharing correct information throughout my community.*

Participant 2

Attitude Question	Answer
Please share one or more ways that the program helped you or your clients prepare more healthful meals.	*I liked the tips and tricks of adding healthy food into every day living (like using an old mint tin to store nuts or trail mix). Also seeing the recipes was a good way to show that eating this way can still be tasty!*
What was the most helpful skill you learned from this program?	*Adding more fish, fruits, and veggies into my diet.*
Did your participation in this program correspond with any changes in overall health (e.g., weight loss, change in blood pressure, change in medication, etc.) for you or your client? Explain.	*I mean, I do need to lose weight and lower my blood sugar, so yes.*
What did you like best about the program?	*The lessons were short, but informative. I am not a person who likes to spend a lot of time in the kitchen, so I would have lost my attention had it kept going on and on and if I felt I were being lectured to instead of educated.*
How could the program be improved?	*Don't use the same recipes over and over...it made it feel like this way of eating is limited to only a few dishes that sound appealing. Also, depending on how this is used, having the exact same intro for each lesson got old! I did several lessons back and to back and found myself tuning out during the intro and forgetting to pay attention again when it got to actual presentation. Also, you could dumb down the section on Phytochemicals for those who are not in the nutrition field - went over my head!*
How would you share the program in your community?	*I am a Case Manager for [an insurance company] and this would be a good workshop to offer to our members - either online or in our Wellness Center.*

Participant 3

Attitude Question	Answer
Please share one or more ways that the program helped you or your clients prepare more healthful meals.	*It has helped me with my relationship with food. I want to make better choices for me and my family.*
What was the most helpful skill you learned from this program?	*Labels on food.*

Did your participation in this program correspond with any changes in overall health (e.g., weight loss, change in blood pressure, change in medication, etc.) for you or your client? Explain.	*Knowledge about better food choices.*
What did you like best about the program?	*The information was very helpful.*
How could the program be improved?	*Shorter PowerPoints*
How would you share the program in your community?	*I would have a seminar and provide brochures and recipes.*

Participant 6

Attitude Question	***Answer***
Please share one or more ways that the program helped you or your clients prepare more healthful meals.	*I liked the new recipe ideas, and I liked the focus on swapping out a lot of foods while not eliminating foods.*
What was the most helpful skill you learned from this program?	*I learned about nuts and seeds, which I didn't know much about going in.*
Did your participation in this program correspond with any changes in overall health (e.g., weight loss, change in blood pressure, change in medication, etc.) for you or your client? Explain.	*I have made fish a couple more times than I usually do while doing this course.*
What did you like best about the program?	*It was friendly and realistic. I really liked the simple recipes, because a lot of recipes online are complicated and inaccessible.*
How could the program be improved?	*Depending on your target audience, I would talk more about microwave options for people who have limited kitchens.*
How would you share the program in your community?	*I would share in local email and church newsletters.*

Participant 9

Attitude Question	**Answer**
Please share one or more ways that the program helped you or your clients prepare more healthful meals.	*The program was full of helpful tips for how to make small manageable changes to the way I eat. I did not have to remember ALL of the ways, but a few that stood out are starting the day with smoothie incorporating fruits and veggies, and steel cut oats. Also, how easy it is to make your own salad dressing and marinades and a good way to incorporate more healthy olive oil. I have been more mindful in my eating, not being on my phone or watching TV and focusing on how full I feel after eating.*

What was the most helpful skill you learned from this program?	*I think the mindfulness approaches will be the skill I most take away from the program. While the other information was very helpful, it was mostly common sense [sic] things I know I should be doing anyway. However, I do not hear much about the mindfulness aspect of eating and how this impacts portion sizes, feelings around food, and satiety.*
Did your participation in this program correspond with any changes in overall health (e.g., weight loss, change in blood pressure, change in medication, etc.) for you or your client? Explain.	*No changes for me yet, but I look forward to making gradual adjustments and changes to my approach to eating and see if this makes an overall change in the future to cholesterol numbers and weight management.*
What did you like best about the program?	*Incorporating very simple recipes, the repetition of the 7 steps to eating the MED way. It reinforced these elements so that it will not be easily forgotten. I also liked that it does not require calorie counting, or calculating micro nutrients and macros. Simple lifestyle changes and watching portion sizes should be effective for most individuals to see a positive impact on health.*
How could the program be improved?	*Depending on who the presenter was in the videos, the volume was sometimes difficult to hear. I would also like to see more emphasis on the connection between mental/emotional health and diet. The better we eat, the better we feel. There was some information about impact on mood, but I would like to see a little bit more. I also found the continuum scales (eat more of this and less of that) to be very helpful and would appreciate having handouts of this so that participants can print to take that with them.*
How would you share the program in your community?	*I facilitate a […] Self-Management Program, part of the Living Healthy series, […]. This program would tie extremely nicely with this program and I could see offering this as a great "next step" for individuals wanting to take their healthy eating to the next level. […] I also hope to be employed with Integrated Behavioral Health within primary care medical office. This program could be very useful for patients being referred that also have chronic health conditions as well.*

Participant 10

Attitude Question	Answer
Please share one or more ways that the program helped you or your clients prepare more healthful meals.	*Healthier food choices and preparation*
What was the most helpful skill you learned from this program?	*Mindful Eating*
Did your participation in this program correspond with any changes in overall health (e.g., weight loss, change in blood pressure, change in medication, etc.) for you or your client? Explain.	*Not yet, but will*
What did you like best about the program?	*Recipes*
How could the program be improved?	*No issues*
How would you share the program in your community?	*Talking with friends about the program*

Participant 14