Developing a Web-based Learning Experience for Nutrition Among Future Health and Sports Science Professionals

Prepared by

Melissa K. Casimir, B.A. General Biology, Kean University Class of 2019

Sandra Sertile, B.A. General Biology, Kean University Class of 2019

Emily Breen, M.A. Educational Psychology, Kean University Class of 2020

with

Kim Spaccarotella, Ph.D., Kean University

Ed Johnston, M.F.A., Kean University

Keywords: nutrition, diet, calories, self-efficacy, social cognitive theory

Abstract

Nutrition education theories support the use of videos to help individuals take steps towards changing their behavior. The purpose of NOURISH (Nutrition Outreach to Undergrads in Sports Science and Health Professions) is to develop a multimedia, theory-based nutrition website for students preparing for careers in medicine and sports science. Research has shown that nutrition knowledge and resources are often limited for students pursuing careers in sports medicine or medicine. NOURISH was a collaboration with Kean University's graphic design team to develop interactive review questions and a brief video to help students learn about pre-exercise hydration guidelines using the multimedia learning theory and the social cognitive theory.

A short questionnaire was sent to faculty members to provide a formative evaluation of the usefulness of the video and website content. Faculty members (n=5) reported that the video would be helpful in facilitating student understanding of pre-exercise hydration guidelines, that the knowledge questions were very helpful in reviewing content and that the logo and colors would be helpful in capturing viewer attention. Based on this feedback, additional edits were made to improve video clarity, as well as to update the logo and colors for future pilot testing. Developing theory-based, multi-media nutrition education tools may be an effective strategy for providing university faculty with resources that are perceived as likely to capture the attention of students and improve retention of nutrition content.

Introduction

Research suggests that there may be a lack of nutrition knowledge among undergraduate students preparing for careers in sports science (Torres-McGehee et al., 2012) or medicine (Vetter et al., 2008; Crowley et al., 2014). Developing nutrition videos that integrate words, pictures, and interactive experiences simultaneously, help to maximize learning (Brame, 2016). Nutrition videos are a quick, free tool for undergraduate students to obtain more nutrition knowledge in key areas such as carbohydrates, pre- and post- exercise hydration, weight loss, fats, serving sizes, and micronutrients without having to pay for additional coursework. Self-test questions at the end of each video help to reinforce core content from the video and allow students to gauge how much they have learned from viewing the videos (Mayer, 2008).

Social cognitive theory suggests that a learner is more apt to perform a new behavior after watching others succeed (Bandura, 2004). Videos can enhance learning using images that facilitate behavior change and self-practice activities. Based on prior research (Ramsay, 2012), effective theory-based nutrition videos use real scenarios and settings, provide short segments and simple messages, convey a skill-in-action and are developed so that viewers can conceptualize the information and use it in daily life. According to multimedia learning theory (Mayer, 2008), videos can be made more effective by including text/audio and pictures/images together. Working memory has both a visual/pictorial channel and an auditory/verbal processing channel (Mayer, 2008; Mayer, 2010). Although each channel has limited capacity, the use of the two channels can facilitate the integration of new information into existing cognitive structures. The channel refers to the brain or multimedia designs. Thus, design strategies that manage the cognitive load for both channels in multimedia learning materials promise to enhance learning. For example, relevant words presented in a real-world setting should accompany the images for the readers to engage their verbal working (short-term) memory (Mayer, 2008). Lessons can be

broken into self-paced segments to help learners process a manageable amount of content at a time, and redundant material (similar material that has been used repeatedly) should be edited to reduce extraneous cognitive processing (Mayer, 2008). Lastly, verbal and pictorial information should build upon the viewer's prior knowledge to maximize learning (Mayer, 2008). The theories were utilized to all the videos for improved coherence and contiguity and to highlight essential material.

The purpose of Project NOURISH (Nutrition Outreach for Undergraduates in Sports Science and Health) was to create a brief online nutrition video series and interactive website that incorporated effective e-learning strategies as a resource for students preparing for careers in sports science and medicine (https://projectnourish.github.io/). The present study describes pilot testing of the initial, formative evaluation for the first video in the series, which focused on pre-exercise hydration. The topic was chosen based on prior research in the field identifying this as an area of confusion for many sports science and health professionals (Shirreffs et al., 2004; Torres-McGehee et al., 2012). Guided by best practices in the design of nutrition and health education videos and multimedia content (Ramsay et al., 2012; Mayer, 2008), the NOURISH videos incorporated real scenarios in a familiar setting (university campus), were brief, and presented simple messages. The videos were 5 minutes long. Based on the research conducted by Ramsay et al (2012), effective theory-based nutrition videos, which are the type of videos used in the project NOURISH, implemented learning strategies such as: using real scenarios, providing short segments and simple messages, conveying a skill-in-action so participants can relate to those settings, and supporting participants' abilities to conceptualize the information and practice using it by developing "test your knowledge" interactive review questions.

Methods

The project was deemed exempt by the Kean University Institutional Review Board. A recruitment email was sent out to faculty members who were currently teaching courses for students in the health and sports science fields (e.g., athletic training, exercise science, or human biology). Interested faculty clicked on the link provided and reviewed the informed consent. The videos were designed and developed by reviewing current literature on pre-exercise hydration in PubMed during Fall 2016. The research conducted by Ramsay et al. (2012) served as a model for this research. Ramsay et al. presented six different characteristics of nutrition education videos that support learning and motivation to learn. Ramsay et al. found that using videos in nutrition education programs help aid in learning. A brief video on hydration was filmed to portray students following pre-exercise hydration recommendations. Kean's graphic design team developed interactive review questions and a project identity to reinforce the video content and improve the student learning experience.

Five faculty members in the health/science disciplines viewed the pre-exercise hydration video and completed a brief survey in Qualtrics, designed based on previous research (Ramsay et al., 2012), to share feedback about design flaws and the usefulness of the graphic design elements present in the video, as well as to provide a faculty perspective on the content and features they believed would best support student learning. The responses were anonymous. Based on the feedback from the online survey, the faculty found the video and website helpful in reinforcing the student learning experience.

Results

Faculty found the video and website helpful in reinforcing the student learning experience. The "test your knowledge" interactive review questions at the end of the video and summary tables were perceived as enhancing the video's effectiveness while helping students review/retain key information. Scores were lowest for perceived ability of the logo to capture students' attention (Table 1). Written suggestions included recording sections of the video again to improve sound quality. After gathering feedback from faculty, a theory-based approach was applied to edit all of the videos for improved coherence and contiguity and to highlight essential material (Mayer, 2008). Adjustments included updating the NOURISH logo with consistent colors and font so that the design supported the project's identity, rewriting scripts to improve clarity, re-recording parts of the video to improve sound quality and modifying graphic design elements including color and font to better highlight important information and create a visual hierarchy. The visual hierarchy is the order of how a user processes information on a page. This can include adjusting the color, typography, contrast, spacing, composition and scale. These are great tools to add accent to certain parts of the design.

Table 1.
Formative Evaluation of Design Elements in Nutrition Video

Survey Questions	Mean Scores	Standard Deviation
Video helps students understand pre-exercise hydration guidelines?	3.67	0.58
Knowledge questions review content?	4.33	0.58
Logo will capture attention?	4.00	1.00
Colors will capture attention?	3.33	2.33
Summary tables reinforce content?	3.67	1.33

Note. Responses were scored on a scale of 1 (not likely/helpful at all) to 5 (extremely helpful) and space was given for comments

Figure 1

Original NOURISH Logo

Note. Before using theory-based approach for NOURISH Logo

Figure 2

Revised NOURISH Logo

Note. After using theory-based approach for NOURISH Logo.

Discussion

      Although use of theory-based videos in nutrition education has increased (Ramsay et al., 2012), there is limited research on their use among college students in the health profession field and on faculty perceptions of the features that would make the videos most helpful as teaching aids in the classroom. The use of cognitive multimedia theory (CMT) can be helpful when making brief nutrition videos to be used as teaching tools for students. Using videos helps people to learn more deeply by using words, pictures, and interactive experiences together. The principles of CMT may help to reduce extra content to make videos more effective (Mayer, 2008). This theory has five principles: the coherence principle, which eliminates extraneous

material; the signaling principle, which helps to highlight essential material; the redundancy principle, which presents pictures and spoken words; the spatial contiguity principle, which places printed text next to the corresponding part of the graphic; and the temporal contiguity principle, which presents corresponding graphics and words at the same time. Applying CMT principles is a cost-effective strategy to guide the development of nutrition videos that are more likely to capture the viewer's attention and improve retention of content.

By surveying expert faculty, the current project identified key areas that increase perceived usability, including logo design and colors to capture the audience's attention, and the importance of review questions in enabling faculty to use nutrition education videos to reinforce classroom content. Because the videos are self-paced and available at the student's convenience, they foster self-directed learning and assist faculty in meeting recommended best practices for integrating technology in the classroom (Snydrer, 2009). Future work will include pilot testing the entire video series with students and soliciting their feedback to make further improvements. Overall, the faculty suggestions provide invaluable feedback for improving the learning experiences of students seeking to increase their nutrition knowledge by watching the video series and answering the accompanying review questions.

References

Bandura, A. (2004) "Health Promotion by Social Cognitive Means." *Health Education & Behavior,"* 31(2). 143-164. https://doi.org/10.1177/1090198104263660

Brame, C.J. (2016) Effective educational videos: principles and guidelines for maximizing student learning from video content. *CBE: Life Sciences Education*, 15(6), 1-6. https://doi.org/10.1187/cbe.16-03-0125

Crowley, J. et al. (2014) "Impact of an undergraduate course on medical students' self-perceived nutrition intake and self-efficacy to improve their health behaviors and counselling practices." *Journal of Primary Health Care*, 6(2), Pg 101-107. http://dx.doi.org/10.1136/bmjopen-2019-034377

Mayer, R. E. (2008) Applying the science of learning: Evidence based principles for the design of multimedia instruction. *American Psychologist,* 63 (8), 760-769. https://doi.org/10.1037/0003-066X.63.8.760

Mayer, R. E. (2010) Applying the science of learning to medical education. *Medical Education*, 44, 543-549. https://doi.org/10.1111/j.1365-2923.2010.03624.x

Ramsay, S. A., Holyoke, L., Branen, L.J., & Fletcher, J.W. (2012) Six characteristics of nutrition education videos that support learning and motivation to learn. *Journal of Nutrition Education and Behavior,* 44 (6), 614–617. https://doi.org/10.1016/j.jneb.2011.10.010

Shirreffs, S. M., Armstrong, L.E., & Cheuvront, S.N. (2004) Fluid and electrolyte needs for preparation and recovery from training and competition. *Journal of Sports Sciences,* 22 (1), 57–63. https://doi.org/ 10.1080/0264041031000140572

Snyder, M. M. (2009) Instructional-design theory to guide the creation of online learning communities for adults. *TechTrends* 53 (1), 48-56. https://doi.org/10.1007/s11528-009-0237-2

Torres-McGehee, T. M. et al. (2012) "Sports nutrition knowledge among collegiate athletes, coaches, athletic trainers, and strength and conditioning specialists." *Journal of Athletic Training*. 47(2). Pg 205–211. https://doi.org/10.4085/1062-6050-47.2.205

Vetter, M. et al. (2008) "What do resident physicians know about nutrition? An evaluation of attitudes, self-perceived proficiency and knowledge." *Journal of the American College of Nutrition, 27*(2). Pg 287-298. https://doi.org/10.1080/07315724.2008.10719702