

Massive Open Online Courses: How Registered Dietitians Use MOOCs for Nutrition Education

FOR SEVERAL DECADES, LEARNERS have been able to take courses and get continuing education online; but in 2011, a new type of distance learning took off in the form of massive open online courses, or MOOCs.¹ These large-scale courses typically share some common features: open access using the Internet, free of charge, asynchronous, interactive user forums, and the opportunity to earn a document of completion or achievement.² Most MOOCs are offered through several existing web-based platforms or initiatives that have formed collaborative partnerships with top global universities to provide courses on a wide range of subjects. A typical MOOC includes videos, resources, assignments, and assessments offered within a defined time period with characteristics similar to traditional face-to-face classes. Coursera (www.coursera.org), edX (www.edx.org), and Udacity (www.udacity.org) are some of the more well-known platforms, although there are many other MOOC providers (www.mooc-list.com). Some providers, such as Udacity, focus on technology-related topics, whereas others, such as Coursera and edX, offer a growing number of food-, nutrition-, and health-related MOOCs developed by a diverse group of academic institutions.

The conversations and controversy surrounding MOOCs have stimulated discussion about teaching and learning in general, and challenged many educators to evaluate and elevate teaching

strategies.¹⁻⁹ On the one hand, MOOCs have been praised for their ability to bring the educational opportunities of elite institutions to a wider audience and as a way to address the increasing costs of higher education. On the other hand, they have been criticized for their inconsistent quality and low completion rates (rarely >15%) and for the limited amount of research on their effectiveness to promote learning. Figure 1 highlights some key pros and cons of MOOCs for participants and instructors. Although concerns that MOOCs might dismantle traditional higher education are likely unfounded, there is little doubt that the role and scope of educational technology and informatics will continue to expand in the classroom and beyond. Nutrition and health professionals can play a role in using MOOCs to educate a wide range of audiences. Two examples (discussed later) show how MOOCs have been used by registered dietitians (RDs) to provide nutrition-related educational opportunities for global audiences—public and professional.

REACHING A WORLDWIDE PUBLIC

One reason MOOCs have received so much publicity is because of their soaring enrollments. The very first MOOC offered, in 2011, a course on artificial intelligence by Stanford University, had an enrollment of 160,000.¹ College instructors, who previously considered a course with hundreds of students large, may find the online version of the same course offered through a MOOC consortium now attracting thousands, if not tens of thousands, of students. Because there is no fee to enroll or obligation to participate, anyone worldwide with access to the Internet can sign up.

Creating a MOOC for the Public: Course Design and Development
Nutrition, Health, and Lifestyle: Issues and Insights is a MOOC offered through

Coursera. It was adapted, in part, from an undergraduate introductory nutrition course taught at Vanderbilt University, one of Coursera's consortium partners. The target audience was anyone with an interest, but not necessarily a background, in nutrition. The aim of the course was to explore nutrition concepts that become conversation topics among consumers interested in food choice as it relates to optimal health and physical performance. Students could learn how to evaluate not only personal food choices and overall dietary patterns, but nutrition-related content in the media and advertising.

The 6-week course consisted of 12 assignments, which included six quizzes and six written weekly assignments. The weekly content quizzes had 10 to 15 questions and the assignments related to activities or readings on the weekly topic. Completers had to earn at least 50% of possible points on quizzes and assignments to receive a statement of accomplishment. Further details about the course are shown in Figure 2.

To create the course, the instructor, an RD, determined core content and objectives, and then designed a multi-column course planning document to break weekly topics into segments that would form the basis for multiple videos comprising the recommended 2 hours total of video per week. Working with the Vanderbilt production staff, the instructor lectured in front of a camera using PowerPoint slides as a teleprompter to create more than 65 video segments, ranging in length from 5 to 22 minutes. Two or three multiple choice or polling questions were embedded within each video for students to consider and answer as they watched.

Much of the instructor's preparation time went into editing, refining, researching, and referencing the content of the slides used for the course. All images used had to be cleared in terms of copyright and permissions or be created "from scratch," a challenge

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Pros	Cons
For Participants <ul style="list-style-type: none"> • Free, open to all, can enroll with no obligation to participate • Wide range of topics available from top universities around the world • Course interactions reflect a global student body 	
For Instructors <ul style="list-style-type: none"> • Same effort can reach thousands or tens of thousands for global impact • Repeat sessions less costly and time-intensive to deliver • Course materials can be used to augment face-to-face instruction • Experience can enhance reputation and teaching skills 	
	<ul style="list-style-type: none"> • Academic and continuing professional education credit rarely offered • Many courses only offered during specific time frames • Little or no direct interaction with instructor • Time-consuming and expensive to produce with limited return on costs • Delivery requires access to a MOOC consortium or other platform • Little or no direct interaction with students and low completion rates • Limited research to date on effectiveness of MOOCs to promote learning

Figure 1. Pros and cons of massive open online courses (MOOCs) for participants and instructors.

after using “fair use” images in the classroom for years. Part of the weekly videos included interviews with such relevant guests as a photographer and author of a food-related book; an executive with a food company that produces functional foods; an expert in sports nutrition; and two Vanderbilt undergraduate students, one a vegan and one with celiac disease. Coursera students seemed to appreciate new faces and the variety in approaches.

Course Implementation

The course was launched on May 6, 2013, after an enrollment period of several months. Due to the accessibility, affordability, flexibility, and appeal of MOOCs, this course attracted more than 85,000 students with a variety of backgrounds, nationalities, languages, ages, educational levels, interests, and abilities. Of those participants who completed the precourse survey (n=13,435), more than half (53%) came from 147 countries outside the United States. Thirteen of those countries had more than 150 enrollees (Figure 3). Based on the precourse survey, most students were older than college age, with the largest percent (21%) between 25 and 29 years, and an overall average age of 35 years. The students' age range is consistent with their reported highest education level, which showed the majority had college degrees or higher (Figure 4).

The discussion forums were very active (Figure 2). It was apparent that many of the students were passionate and opinionated about nutrition. The threads with the most posts revolved around “where are you from?”, genetically modified foods, photographs of food labels from countries outside of the United States, Paleo diets, food additives, plant-based diets, gluten, and course feedback. An interesting aspect of the course was students' attitudes about their own diets, especially compared with the US population. Within the first week on “What is a Healthy Diet?”, most students already perceived their diet as healthy. Almost half (43%) of the Coursera nutrition students (n=12,034) reported their overall diet as extremely or very healthy in response to a polling question embedded in the first week's video. This is almost twice the 23% who gave the same response on a 2012 Food and Health Survey (n=1,057).¹⁰ Many students resisted approaches or recommendations that differed from their own practices as reflected by comments on the discussion forums. The Coursera students who elected to take and participate in an online nutrition course, however, do not necessarily reflect the general public sample.

Course and content feedback, shared through the discussion forums, was overwhelmingly positive. Students seemed to not only enjoy participating in the course, but had the opportunity

to increase their knowledge and appreciation of nutrition science and its relationship to personal food choice and health. The following is an example of a post that received numerous “up votes” at the end of the course:

Thanks to [the instructor] and staff for the excellent information in this course. I'm really impressed with the extent and amount of resources provided. I appreciated the upbeat attitude [the instructor] exhibited during the entire course. It's clear you have great passion for what you do. Thank you for sharing your knowledge with us!!

Lessons Learned

- Instructor “presence” was important to students. Filming high-quality and engaging videos in such a way as to engage students, participating in the discussion forums, communicating weekly through announcements, and including several virtual “meet ups” (or live office hours) all helped foster an experience that made students feel part of the class with a “real” instructor who wanted them to learn and succeed.
- It is critical to include content on practices and policies outside of the United States when creating an open online course for a

VU Coursera Course ^a		UNICEF Training Course ^b	
Title	Nutrition, Health, and Lifestyle: Issues and Insights	Programming for Infant and Young Child Feeding	
Institution	Vanderbilt University	Cornell University	
Platform	Coursera: www.coursera.org/course/lifenutr	Cornell NutritionWorks: www.nutritionworks.cornell.edu/unicef/about	
Target audience	General public, no prerequisites	UNICEF nutrition and health professionals and their counterparts	
Workload	2-4 hours/week during 6 weeks	12 hours during 90 days	
Cost	Free	Free	
Topics covered	<ul style="list-style-type: none">• Week 1: Just What is a Healthy Diet? A Balancing Act• Week 2: Nutrition Labeling: Facts, Claims, and Challenges• Week 3: Dietary Supplements: Evaluating the Evidence• Week 4: Functional and “Super” Foods: Their Role in Optimal Nutrition• Week 5: Plant-Based Nutrition: Controversies and Considerations• Week 6: Nutrition and Fitness: Facts, Food, and Fuel	<ul style="list-style-type: none">• Undernutrition Basics• Role of IYCF^c in Child Survival, Growth and Development• Essentials of Breastfeeding• Essentials of Complementary Feeding• Comprehensive IYCF Programming• Selected Interventions to Improve Breastfeeding• Selected Interventions to Improve Complementary Feeding• IYCF in Emergencies• IYCF in the Context of HIV/AIDS^d	
Total enrollment	85,029	6,945	
Total active students	42,916 (50%) (viewed at least one video or submitted at least one assignment)	3,500 (50%) (completed at least one unit)	
Activity	Video Lectures Total streaming view 723,528 Total downloads 284,621 Number of video participants 33,269 Quizzes Total quiz submissions 103,527 Total assignment submissions 38,784 Total in-video questions submissions 1,170,386 Discussion Forums Total threads 1,449 Total posts 12,713 Total votes 111,763	Video Lectures Data not available Quizzes Total unit test submissions 33,743 Discussion Forums Total threads 179 Total posts 309	
Completion	Users who got >70% on assignments 5,554 Users who got 50%-70% on assignments 979 Overall completion rate 8% Completion rate of active students 15%	Users who got 100% on all 12 unit tests and the final examination 2,255 Overall completion rate 32% Completion rate of active students 64%	

^aBased on session offered May 6, 2013-June 16, 2013.

^bBased on enrollments between July 23, 2012 and March 14, 2014.

^cIYCF=infant and young child feeding.

^dHIV/AIDS=human immunodeficiency virus/acquired immunodeficiency syndrome.

Figure 2. Course description, enrollment, and participation in the Vanderbilt University (VU) Coursera course and the United Nations Children's Fund (UNICEF) training course.

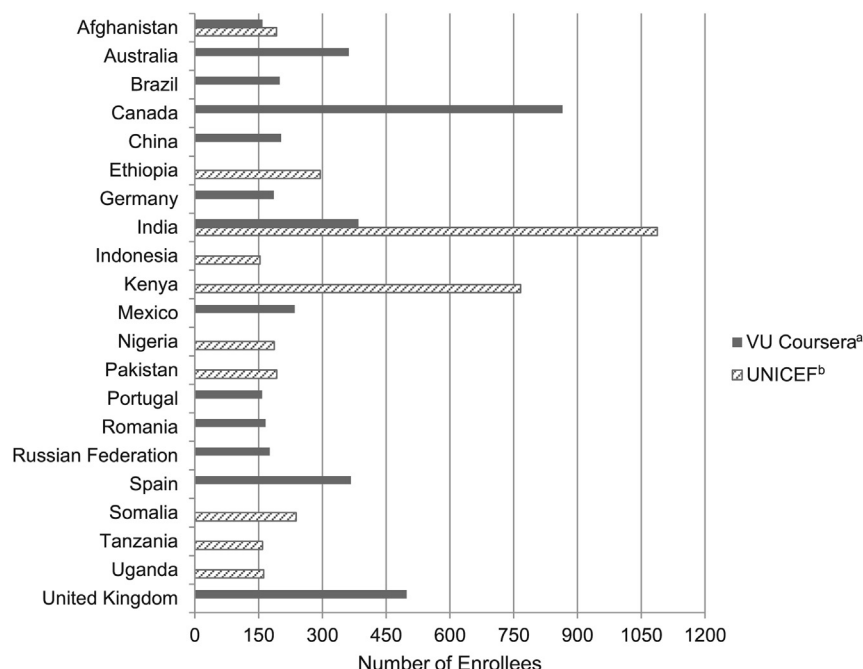


Figure 3. Number of enrollees in the Vanderbilt University (VU) Coursera course and the United Nations Children's Fund (UNICEF) training course from countries outside the United States with more than 150 students enrolled. ^aBased on results of pre-course survey (n=13,435). ^bBased on enrollment as of March 14, 2014 (n=6,945).

worldwide audience. An online course open to all who are interested without prerequisites and at no cost attracts a global student body. This less "United States-centric" content could be

incorporated into courses at US universities to broaden the scope for their international students and to meet the need for US students to develop understanding and appreciation for

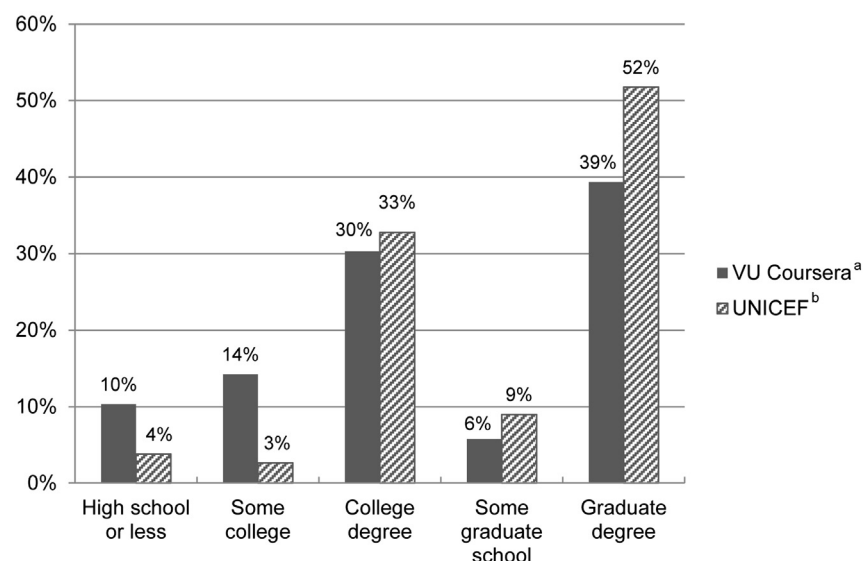


Figure 4. Highest education level of enrollees in the Vanderbilt University (VU) Coursera course and the United Nations Children's Fund (UNICEF) training course. ^aBased on results of precourse survey (n=13,106). ^bBased on enrollment as of March 14, 2014 (n=6,945).

practices and policies outside the United States.

- RDs who are MOOC instructors need to embrace the evolving nature of nutrition science and be prepared to address questions with the most current and evidence-based information. The Coursera students were more likely to question the instructor and voice their opinions than the typical undergraduate in a traditional classroom. This could be due to the online students' higher educational level, their interest and opinions about nutrition coming into the course, the anonymity of the online platform, as well as the absence of worry about a letter grade.

REACHING PROFESSIONALS IN DEVELOPING COUNTRIES

MOOCs can be used to provide nutrition courses to the masses, but this type of distance learning can also be a cost-effective and convenient way to provide continuing education to nutrition and health professionals worldwide, particularly those in developing countries. In-person workshops are expensive to conduct and reach only the limited number who can travel to workshop sites. Governments and nongovernmental organizations need affordable and efficient ways to train their community-based staff who cannot easily travel to training sites.

Creating a MOOC for Professionals: Course Design and Development

In 2009, senior staff and specialists in the Nutrition Section at the United Nations Children's Fund (UNICEF) headquarters expressed interest in using distance learning as a way to train their nutrition staff worldwide in the area of programming for infant and young child feeding (IYCF). To create an online training on this topic, the agency approached the Division of Nutritional Sciences at Cornell University, which has an established online professional development program led by an RD (Cornell NutritionWorks; www.nutritionworks.cornell.edu). UNICEF funded the Cornell staff time needed to jointly develop and deliver the content to the target audience, and Cornell

University contributed the use of the existing Cornell NutritionWorks online platform.

Before creating the course, a needs assessment of the target audience was conducted. An online survey was sent to the approximately 300 UNICEF nutrition staff worldwide to assess their interest and technical capabilities in using a distance-learning platform for training in IYCF. UNICEF staff were encouraged to also send the survey to their in-country partners. Staff were asked about their technical access (eg, type of computer, operating system, reliability of Internet connection) as well as their job responsibilities including the amount of support and time they receive for professional development, their goals for professional development, and their interest in taking an online training course. Two thirds ($n=140$) indicated that they would be very likely to take an online course on nutrition within the next year. For format, one quarter said they would likely take an online course, and just more than half (55%) said they would likely take an online course combined with in-person training.

Based on the results of the needs assessment, UNICEF and Cornell NutritionWorks jointly developed a 12-part online training on *Programming for Infant and Young Child Feeding*. The objective of the training course is to enhance the competencies and build capacity of UNICEF staff and their counterparts who are involved in IYCF programs in developing countries. This includes program development, implementation, evaluation, as well as other related activities for improving nutrition and health outcomes of infants and young children.

The training course consists of 12 units: nine lecture units and three case studies. Each lecture unit includes a taped audio-visual presentation by an expert in that topic, related resources and tools, and an online unit test. The case studies help participants apply the training materials to real world situations. After passing all 12 unit tests, participants must take an online final examination and course evaluation survey to complete the course. Completers receive a personalized certificate of completion worth 12 continuing professional education units. Cornell NutritionWorks is a Continuing Professional Education

Accredited Provider of the Commission on Dietetic Registration. Additional details about the course are shown in [Figure 2](#).

The course is designed so that people worldwide can register at any time. Once they register, they have 90 days to complete the course before their registration expires. E-mail reminders about the deadline are automatically sent after 60 days and 75 days. If their registration expires, they can re-register at no charge, but they have to start the course over. The videos have questions embedded to keep the learner engaged, but there is no required interaction with an instructor. All tests and the final examination are auto-graded by online software. Participation in the discussion forums is optional. Any questions related to content or technical issues are answered by the course staff through e-mail.

Course Implementation

The course was pilot tested by nine UNICEF or World Vision International staff from different countries and revised based on their feedback. The availability of the course was announced by an e-mail to UNICEF staff on July 23, 2012. They were encouraged to promote the course to their in-country colleagues, counterparts, and partners. The stated goal was to reach 200 nutrition and health professionals within the first year.

Interest in the course far exceeded expectations. Within 1 month, more than 1,600 people had registered for the course, and within a year that number had climbed to more than 5,000. At present, more than 7,000 professionals from 168 countries have registered, with the majority (92%) coming from outside the United States. The high enrollment rate led it to be dubbed Cornell's first "mini-MOOC."¹¹ The highest level of interest from individual countries has come from India and Kenya, which account for approximately 27% of registrations. Ten countries have had more than 150 people register ([Figure 3](#)). Most registrants were employed by nongovernmental organizations (33%), whereas other areas of employment have included hospitals and clinics (13%), UNICEF staff or consultants (12%), colleges and universities (10%), and

governments (8%). Not surprisingly for a course targeting professionals, almost all who have registered have at least a college degree and more than half have graduate degrees (Figure 4).

One year after the course was launched, the postcourse survey results (n=2,080) indicated:

- 88% of completers said the course was “excellent” or “very good”;
- 98% said that it was well organized;
- more than 95% said they learned “some” or “a lot” on all nine topics, with the majority ($\frac{2}{3}$ to $\frac{3}{4}$) stating that they learned a lot;
- 96% said they intended to apply what they learned in the course to their job; and
- more than half (58%) thought the online learning modality was equally effective compared with a face-to-face workshop.

In response to an open-ended question, many (31%) had specific suggestions for additional topics they would like to see in an online learning course on nutrition. The overall value of the course was reflected in comments such as the following:

I remain grateful to UNICEF and Cornell University for this priceless and also invaluable opportunity to undertake the course. I look forward to creating a positive impact in my community.

Lessons Learned

- There is a high level of interest among nutrition professionals in developing countries to use distance learning for training. A single e-mail from the commissioning organization—with no further promotion—had tremendous outreach. The unanticipated response rate to the UNICEF training course, including a notably high completion rate compared with a typical MOOC (Figure 2), indicates that there is an unmet need for this type of training.
- Setting a time frame for completion and sending reminder notices about the deadline is a way to motivate students to finish. Although this course did not have a set start and end date, providing

each student with his or her own 90-day timeline was important. Many students said that they appreciated the reminders about the deadline as a way to keep them on track.

- Discussion forums need to be monitored and fostered or even required to increase participation. Although the UNICEF course provided topic-specific discussion forums, without the resources to allow for active instructor involvement to engage in or promote discussion, the forums were not used that much.
- Targeting professionals in developing countries requires providing a variety of format options, such as multiple video formats and offline versions; therefore, those with intermittent Internet or low-bandwidth connections can still access the content.

IMPLICATIONS FOR DIETETICS PRACTICE

Opportunities and Challenges of MOOCs

Opportunities

- The new MOOC platforms provide RDs, particularly those associated with institutions of higher education, a way to deliver high-quality nutrition education to tens of thousands of individuals worldwide. RDs should play a role in designing and implementing MOOCs. Coursera currently partners with more than 100 institutions, and edX partners with more than 40. As the number of partner institutions continues to increase, this will only expand dietitians' access to these educational platforms.
- Distance education can be a cost-effective and convenient way to provide high-quality continuing professional education, particularly for those in low- and middle-income countries. For example, UNICEF estimated the cost per person to conduct a regional in-person training workshop for 30 people, which included airfare for some

participants, to be 40 times more than the cost to date per course completer in the online training course (Christiane Rudert, MSc, UNICEF, personal communication, January 7, 2014). As more people complete the online course, the cost per person will decrease even further. Some nutrition-related courses offered through Coursera provide the option of continuing professional education units for dietetics practitioners and other professionals for a small fee.

- Completion rates do not tell the whole story.^{7,8,12} As with any MOOC, registration rates only reflect those who sign up—they do not indicate any involvement beyond that. It must be assumed that many registrants never intend to complete the course and register only to view the content. In both examples described, half of all enrollees completed at least one unit or assignment. Completion rates in both courses doubled when based on active students who completed at least one course component versus those who simply enrolled (Figure 2).
- Experiences from online courses can benefit face-to-face courses on campus. The videos created for a MOOC can be used to “flip” a classroom, which means students watch the lecture content on their own time and then use the in-person class time to do assignments and have discussions. Lessons learned from a global audience can be incorporated into live offerings.
- As the extent of involvement and participation in MOOCs is voluntary and flexible, as well as available for free, the application of MOOCs in other settings has great potential. For example, health- and nutrition-related MOOCs can be used in secondary schools for education or to explore career paths, in corporate or community health promotion programs, or as continuing education in a variety of fields.
- Having the experience of planning, preparing, and delivering a MOOC through such visible platforms can be personally and

professionally rewarding. An RD's skill set and knowledge base are broadened, enhancing teaching effectiveness and bringing new opportunities.

Challenges

- Creating an online course can be expensive and time consuming.^{7,9} A typical MOOC takes an estimated 200 to 300 hours of instructor time to produce. Additional resources and support staff are also required for quality production and delivery. Although institutions do not typically pay a partnership fee, they do incur the cost of designing and producing a course for the MOOC consortium's platform. In addition, some institutions may consider the instructor's time to develop and deliver a MOOC as part of his or her "regular" job. Once the course is launched, even those designed to be "self-run" can still require significant instructor and staff time to respond to content, enrollment, and technical questions and issues.
- The dynamic nature of nutrition also presents a challenge in maintaining the currency and accuracy of future offerings of the course. MOOC instructors must realize that their job is not over once they have filmed and produced a course. If it is to be offered again, they must commit to updates, and in some instances refilming portions of their course, with the time, resources, and cost that this might entail.

- An online training course does not replace the networking that is of value with in-person trainings. With thousands of students in a course, there is little or no interaction with the instructor. The effectiveness of this type of training to change the behavior of professionals at the community level is also unknown. Although a facilitated online professional development program has been shown to be effective at building capacity of nutrition professionals in addressing childhood obesity,¹³ little is known about whether MOOCs are effective for building a similar capacity.

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