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A test of the first course (Emergency Medicine) that is globally available for credit and for free

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ABSTRACT

Background: The WHO has called for the use of computer-aided education to train millions of additional health providers. We herein address this appeal with the first globally available, free, accredited, computer-aided, and peer and mentor-guided course.
Methods: The intervention studied was NextGenU.org's first course, "Emergency Medicine (EM) for Senior Medical Students", required for the graduating Classes of 2013 at the University of Missouri (UM) and the U.S. Uniformed Services University of the Health Sciences (USUHS). Control groups were the Class of 2012 at USUHS, and students nationally in the Class of 2013.
Results: As of July 2016, there were over 4,000 registered "NextGenUsers" in 145 countries. USUHS NextGenUsers (n=167) averaged 80.3% vs. USUHS control students' 80.9% (n=163, p=0.4) on the Society of Academic EM (SAEM) exam, vs. 71.4% nationally (n=415, $p < 0 \cdot 0001$). UM NextGenUsers (n=35) averaged 71.2% on the SAEM exam vs. 71.4% nationally (n=415, p=0.8). Both EM Clerkship Directors reported good student satisfaction with these asynchronous, competency-based, site-agnostic readings.
Conclusions: This novel model of a free, accredited course is becoming widely used, and has performed as well as some of the world's most-resourced courses.

1. Introduction

The WHO called in 2006[1] for the use of computer-aided education to immediately train an additional 4.3 million health providers worldwide; by 2013, that number had grown to 7 million,[2] with a projection that by 2035 there would be a global deficit of 12.9 million health providers.[3] Adding to this millennial crisis, the *Lancet*'s *2010 Global Commission on Education of Health Professionals for the 21st Century* called for "major reform across the entire medical education system" and highlighted the need for competency-based training and a new era in transformational professional health and medical training.[4] We believe that to successfully respond to these appeals, global learners must have access to high-quality health sciences education with far fewer barriers to entry and completion, and that such education should be offered at least in part online, be competency-based, and provide educational depth through integrated mentor and peer interactions. This article reports the first tests of such an educational tool.

Since these calls for reform, even as Massive Open Online Courses (MOOCs) have begun transforming education, there remain important gaps, particularly in terms of providing high-quality, competency-based training that is globally free and for credit, and which includes educationally-rich peer and mentor supported interactions. We here coin a neologism, labeling this gap-filling tool a DOOHICHE (pronounced "doohickey",[5] e.g. a gadget, with a nod to these educational tools' technical and industrial foundations): a Democratically Open, Outstanding Hybrid of Internet-aided, Computer-aided, and Human-aided Education.

There have been abundant studies published in myriad journals dedicated to the study of online education that have generally shown comparable learning outcomes for online and traditional trainings in a variety of settings.[6,7] However, fewer data have been published on the large-scale use of MOOCs and their safety and

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efficacy in health sciences education, due to the novelty of MOOCs, their use being primarily outside of the health sciences, the proprietary nature of nearly all MOOC data, and other limitations. No one has previously published on the effects of free, globally available, accredited education with embedded peer and mentored activities, available only since April 2012 through NextGenU. It is worth noting that while we believe the scalability of the sharing makes it transformative, the practice of being granted educational credit from another university without paying an additional fee is common for health sciences students. While this experience usually involves individual student travel for an "away rotation," now the Web, plus local and tele-mentors and peer communities allow for a massively-scaled, capacity-building, humanism- and professionalism-promoting, and low carbon emission version of that generous model. This study is the first test of DOOHICHEs' comparability to traditional training.

2. Material and methods

2.1. Design, settings, participants, interventions, main outcome measures

IRB approval for these pilots was obtained from the University of British Columbia (UBC BREB #H12-01071). Written informed consent was not given by participants for their information to be used, as no patient/clinical records were used, only anonymized data on medical student course performance. Data were anonymized before they were analyzed or shared with any co-investigators. NextGenU began piloting this DOOHICHE model in 2011, and launched in April 2012 the first free, globally-available medical school course for credit. NextGenU and its accrediting co-sponsors for each course use this model, providing a freely-available, competency-based didactic and skills-oriented curriculum. For certification, learners must demonstrate adequate knowledge, gained through online learning resources and assessed through objective multiple choice question testing. They must also show appropriate skills and professional behaviors, gained through interactions with, and assessed by, local and/or remotely available peers and mentors, thereby building competent local and global capacity and communities of practice. Further descriptions of how NextGenU's educational methods build on and go beyond best practices from both MOOCs and traditional education are found in the Appendix. More information about NextGenU's methodology, plus the full EM course and all other courses and their competencies, learning resources, and activities may be viewed in their entirety at www.NextGenU.org.

In this first evaluative paper, we analyze data primarily from the two largest cohorts of users to date of NextGenU's first course: Emergency Medicine (EM) for Senior Medical Students. The course's competencies are derived from the Clerkship Directors in EM curriculum[8] and its co- sponsors were the Emory University Center for Injury Control, the International Federation of EM, and the Society for Academic EM (SAEM).

The pilots were planned in both programs in Q2-3 2012 and launched in Q3-2012, educating all medical students who attended these two schools in the Class of 2013, and therefore in the academic year 2012–2013 prior to their medical school graduation. Students in both of the required NextGenU cohorts we examined were instructed to use the NextGenU readings on common EM diseases and presentations, and to take the recommended associated NextGenU quizzes. The remainder of the students' curriculum was uniform across treatment and control conditions.

The first pilot was initiated by the Uniformed Services University of the Health Sciences (USUHS) and used at 11 sites, the cohort was all USUHS students in the Class of 2013. For knowledge transfer in 2011–2012, the control year, all USUHS EM students had been given a paper copy of *Emergency Medicine: Critical Concepts for Clinical Practice*[9] to read. At the University of Missouri (UM), students' clinical experiences were distributed statewide; prior years' students had used the *Emergency Medicine Manual*[10] for their knowledge transfer. At both sites, NextGenU EM course registrants ("NextGenUsers") were compared with national controls taking the test in 2011–2012, and USUHS NextGenUsers were also compared with the prior year'sUSUHS students. Data for prior years' test-takers were not available from UM. Our primary outcomes were 2-sided *t*-test comparisons of the test scores of NextGenUsers vs. traditionally-trained students on the National EM test offered by the Society of Academic EM (SAEM).[11] The SAEM National EM Exam is the standard, online, proctored final examination for medical students in EM clerkships in the United States.[12]

3. Results

As of July 2016, there were more than 4,000 NextGenUsers in 134 countries; either learners taking the courses as individuals, or through experiences offered by professors and/or mentors adopting NextGenU training components. We report on the two largest prospectively-established cohorts of users of such offerings.

NextGenUsers in the Class of 2013 at USUHS scored an average of 80.3% ($\pm$6.4 SD, n=167) vs. Class of 2012 USUHS control students' averaging 80.9% ($\pm$6.8 SD, n=163, p=0.4) on the 2011–2012 SAEM exam, and vs. the Class of 2013 national average of 71.4% ($\pm$8.6 SD, n=415; $p < 0.0001$) on the 2012–2013 SAEM exam (see Fig. 1). Likewise, NextGenUsers at the University of Missouri averaged 71.2% ($\pm$5.7 SD, n=35) vs. the national comparison population (p=0.8) on the 2012 SAEM exam. Both EM Clerkship Directors reported that NextGenU students enjoyed the

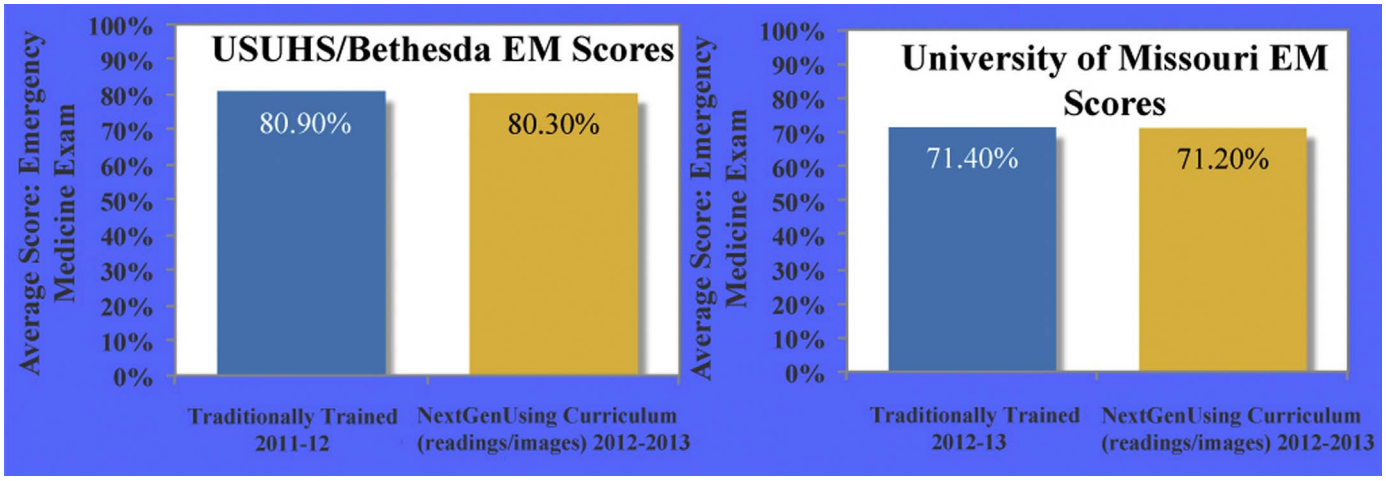

Fig. 1. Average Scores: Emergency Medicine Exam at the USUHS/Bethesda and University of Missouri, traditionally trained vs. NextGenU Curriculum.