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NEBRASKA
MEDICAL CENTER

UNMC Innovators in Education

Exploring new pathways for student interactive learning

Introduction from the Steering Committee Chair

H. Dele Davies, MD, MS, MHCM
Vice Chancellor, Academic Affairs

Author Lloyd Dobyns wrote, "Continual improvement is an unending journey." This is a core philosophy of the UNMC e-learning strategic initiative. We are continually striving to find innovative ways to maintain and build upon the excellence in education for which UNMC is known.

To that end, it is our vision to continue to develop our UNMC E-Learning Center dedicated to supporting and training faculty and students in all aspects of e-learning as part of a faculty-wide teaching academy.

The need for such development is clear. As students from the millennial and postmillennial generation grow more technologically advanced, education needs to grow with them.

The traditional, lecture-based model of teaching does not appeal to many of these students. Instead, they prefer to use the classroom for other activities, such as problem solving, team-based learning and role-playing. In this "flipped-classroom" model, the teacher is more a facilitator of discussion and critical thinking, than a disseminator of information. Furthermore, research shows most attention spans significantly wane after 20 minutes of listening to a lecture.

Therefore, we encourage faculty to be active participants in our e-learning initiative by creating various e-learning platforms that incorporate teaching and assessment tools. Our primary goals are threefold:

1. Enhance the teaching within our colleges.

2. Receive better information on how our students learn so we can best support the most appropriate mode of learning for each student.

3. Provide an environment that enables those of our faculty members with an interest in educational research to test their best theories and publish and disseminate them.

The first group of awardees is included in this booklet, along with brief descriptions of their projects. The selection process is underway for the next group of UNMC Innovators in Education. Together, we will continue on this journey to take education at UNMC to the next level.

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E-Learning External Advisory Board

Brad Fenwick, DVM, MS, PhD, DACVM
Senior Vice President for Global Strategic Alliances at Elsevier

Dr. Brad Fenwick is a Professor of Pathobiology and Microbiology and holds a doctor of Veterinary Medicine and Masters of Pathology from Kansas State University and PhD in Comparative Pathology from UC Davis where he completed his residency and is distinguished alumnus. He is a Fellow with the American Council on Education, a Fellow with the American Association for the Advancement of Science and a Jefferson Science Fellow and Senior Science Advisor to the U.S. Department of State and USAID. Dr. Fenwick has held many senior administrative positions, including Graduate Dean, Vice President, Vice Chancellor and Federal Chief Scientist.

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Dr. Nicholas Lorenzo is a subspecialty and fellowship-trained, board-certified neurologist. He is a serial health care, health care publishing and health care technology entrepreneur. Dr. Lorenzo has also served as the Co-Founder, CEO, President, COO, Chief Publishing Officer and other senior executive positions for Boston Medical Publishing (acquired by McGraw-Hill), eMedicine (acquired by WebMD) and Pearlsreview (acquired by Gannett). eMedicine and Pearlsreview are two of the largest and most extensive electronic/online health care education and publishing systems in the world.

Charles Prober, MD
Senior Associate Dean for Medical Education at Stanford School of Medicine

Dr. Charles Prober is a Professor of Pediatrics, Microbiology and Immunology and Co-Director of the Stanford Center for Clinical and Translational Education and Research. He is an expert in pediatric infectious diseases with an academic career focused on the epidemiology, pathophysiology, prevention and treatment of infections in children. Dr. Prober has directed a number of undergraduate and graduate student courses in the classroom and at the bedside, served as Associate Chair for Education for the Department of Pediatrics, and lectured locally, nationally and internationally on infectious diseases and medical education.

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Ray Schroeder is Associate Vice Chancellor for Online Learning at the University of Illinois Springfield and Director of the Center for Online Leadership and Strategy at the University Continuing and Professional Education Association (UPCEA). He is an inaugural Sloan Consortium Fellow and recipient of the consortium's highest Individual award — the A. Frank Mayadas Leadership Award. He received the 2011 University of Illinois Distinguished Service Award.

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Contact any Committee Member
for information on how you can get involved in the e-learning program.

E-Learning Projects and the Innovators Who Created Them

Clinical Management of HIV Infection: A Flipped Classroom Model Incorporating Web-Based Modules and Active-Learning Case Exercises

Project Directors: Sara Bares, MD — College of Medicine

Uriel Sandkovsky, MD — College of Medicine

Project Members: David McMillan, PhD — College of Medicine

Susan Swindells, MBBS — College of Medicine

The CDC estimates more than 1.1 million people in the United States are living with HIV infection. Antiretroviral therapy has improved significantly over the last several years and most of the care of HIV-infected patients is now provided in the clinic, where there is less time for "bedside teaching" than in the inpatient setting. Moreover, follow-up of laboratory testing occurs after trainees have left the clinic, in settings that are not conducive to didactic discussions of management options.

Training programs have responded to this gap in ambulatory HIV training by providing dedicated didactic sessions to review the core topics regarding the clinical management of HIV infection. The physicians from the HIV program at UNMC train fellows in adult and pediatric infectious diseases (ID) from both UNMC and Creighton University Medical Center (eight fellows total). We meet with the fellows twice monthly to provide supplemental teaching and didactic workshops on important topics in HIV management. Although the sessions have been well-received, we have found ourselves competing with smartphones and pagers for the fellows' attention. This is a common challenge faced by today's medical educators. Many challenges to current models of medical education have been identified and the two that resonate most with our experience are distracted audiences and hit-or-miss clinical exposure during rotations leaving gaps in trainees' experience.

One increasingly appreciated innovation to address these challenges is the "flipped-classroom" model in which students receive and master new knowledge outside the classroom, thereby allowing educators to use classroom time to reinforce learning and address students' questions (Mehta et al. Acad Med 2013;88:00-00). This model is ideal for medical trainees with different degrees of knowledge and experience because it gives them the opportunity to review didactics on their own time and at their own pace while taking advantage of the group "classroom" setting to apply the knowledge learned.

Using the flipped-classroom model, we designed an electronic course on the clinical management of HIV and plan to pilot the course with the incoming group of UNMC and Creighton University Medical Center ID fellows in July 2014. The course is comprised of eight modules that will be administered over a period of four months. Interactive Web-based modules have been designed using Articulate Storyline and will be made available to course participants up to two weeks prior to the group session. We will spend group "class" time working through different case scenarios (e.g., counseling a newly diagnosed patient, design and initiation of a new ART regimen, genotype interpretation, etc.). Multiple instructional methods including role play, team-based learning and team problem-solving will be used during class time in order to create a learner-centered environment.

Knowledge gain/curriculum effectiveness will be assessed by a pretest/posttest design using a validated standardized assessment tool developed by the HIV Medical Association (HIVMA). Additionally, a brief survey designed to assess attitudes and perceptions about both the flipped class instructional model and the course content will be administered both at the beginning and end of the course. It is our hope that our flipped classroom HIV e-learning course will be well-received by the participants and serve to maximize individual learning.

Employee Satisfaction: A Leader's Challenge

Project Director: Teresa Barry Hultquist, RN, PhD, APRN-CNS — College of Nursing
Project Members: Deanne Ernesti, RN, MSN — College of Nursing
Suhasini Kotcherlakota, PhD — College of Nursing
Susan Waters, MS — College of Nursing

Health care organizations need employees with leadership skills who can successfully navigate politically delicate situations; synthesizing and prioritizing action steps directed toward issue mitigation and resolution. As part of the UNMC College of Nursing's LEAD (Masters Leadership/Administration) courses, faculty are dedicated to ensuring education is current and based on real-life situations occurring in the health care environment. This e-learning module, developed by faculty based on real-world experiences, consisted of an online simulated game environment and then flipped classroom for students to practice leadership skills. The situation involved declining employee satisfaction in an organization with high staff turnover and poor employee/management relations. The game environment allowed students to a) use **political savvy** skills to determine which individuals (and questions) to ask, b) **prioritize** interaction with individuals ("talk" with two of three individuals: nursing staff member, human resources, Chief Nursing Officer [CNO]), c) **synthesize** main issues and d) **decide** action steps. During the flipped classroom, critical thinking was cultivated as faculty and students dialogued about similarities and differences in decisions and developed a consensus of best practices.

The project consisted of four sections: 1) initial instructions including purpose and steps to complete the module, 2) interactive scenario (in a online simulated gaming environment), 3) assessment of the students' choices in political savvy, priority setting and problem solving, and 4) asynchronous and flipped classroom dialogue. The project promoted student control, active application and investment of the material presented, both within the interactive scenario and the assessment. In the scenario, students were asked by the CEO to investigate recent troubling employee survey findings. Students became the Quality and Risk Manager avatar and watched avatars interact in a Critical Access Hospital, including the CNO, the Mayor, the Human Resources Manager and a Nursing Staff Member. Students clicked on characters or objects (i.e. computer screen, telephone) to move through the scenario. Students viewed the scenario as many times as they wished.

The game's assessment contained three individuals to talk to, with three questions per individual. Students could only choose to "talk" with two of three individuals. They were able to ask two questions of the first individual; and one question of the second individual. Rationale for the questions indicated the priority of both the individual and question chosen (best, second best, least desirable) as well as the reason the individual and question was prioritized in that way. Scoring was captured in Blackboard, based on the order and choices of the students. Initially, students were able to complete the assessment twice. However, based on student feedback that they were curious about other questions and responses, this was changed to unlimited attempts.

Initial results indicated five of seven students talked to the "best" individual as their first or second choice. Asynchronous and flipped classroom questions prompted dialogue about what evidence-based literature supported leaders in political savvy, priority setting and decision making about change, influence of organizational culture and climate, survey processes, their own priorities and satisfaction in their choices of the order of individuals and questions, competencies and skills they used, and what extenuating factors might influence the choices (e.g., would choices be the same in a large organization rather than a critical access hospital).

Since this initial project, two more scenarios were developed, one on paper (Integrating Organizations after a merger) and one based on an existing video (Workplace Harassment). Accompanying online assessments are in place for both scenarios, as well as flipped classroom dialogue questions. The Integrating Organizations was completed in the spring semester. The Workplace Harassment scenario is scheduled to be deployed in a summer course at the end of June 2014.

Student comments included:

"I found it to be interesting and challenging. As a Director in a rural community hospital, I can relate to receiving a voicemail from the CEO or CNO that says I need information about why these scores are so low by tonight."

"Overall, this is a very neat concept and I look forward to doing the next one."

"I really enjoyed the activity; it reinforced my knowledge of leadership skills and improved my confidence for next time. I also appreciated doing something different other than the same reading and then discussion board postings."

Health Literacy and Communication for Health Professionals (COPH Online Course and Coursera MOOC)

Project Director: Denise H. Britigan, PhD, MA, CHES — College of Public Health
Project Members: Analisa McMillan — College of Public Health
Karen Honeycutt, MEd, MLS(ASCP)CMSMCM — School of Allied Health Professions
Janice Tompkins, MPH, MT(ASCP) — School of Allied Health Professions
Sergio Costa, PhD — College of Public Health
Megan Kelley — College of Public Health

This course promotes better retention and application of the course material for students due to the relevant content, the interactions between the course participants (student, peer and faculty), and the authentic learning assessments that are relevant to the students' lives and careers. Building a course that was engaging to the students and allowed them to master skills that were relevant to their discipline was an important factor in the design. Video lectures were "chunked" into manageable five to 20 minute segments to accommodate the limitations of a person's working memory.

The course also encourages peer-to-peer engagement with group work, video-scenario discussion board questions and open-ended discussion board questions that allow the student to use critical thinking skills and apply the course content in meaningful ways. Authentic assessments in the course evaluate the students' skills and abilities in "real-world" contexts that are relevant to the inter-professional disciplines. The course assessments support analytical skills, creativity, collaboration skills and content integration. Students will complete projects that are relevant to health literacy in their discipline. These include but are not limited to health literate written and spoken message design, communication infographics, social media photo stories, conducting interviews in their field, exploring case studies and staying current with health literacy in the news.

There is a need for health care personnel and public health professionals to learn effective communication skills in the context of the social, economic and environmental determinants of health. Health literacy allows the public and personnel working in all health-related contexts to find, understand, evaluate, communicate and use information to make informed decisions about health. Health care professionals in all disciplines need to learn about effective and practical measures to ensure proper flow of health information. Health literacy is a social justice, patient safety, cross-cutting effective cultural communication issue.

Searching the Library for Evidence

Project Directors: Heather L. Brown, MA — McGoogan Library of Medicine
Alissa V. Fial, MA, MLIS — McGoogan Library of Medicine

Each fall semester, the library leads a one-hour-50 minute instructional session for students enrolled in Nursing 316: Evidence-Based Nursing Practice and Leadership in Nursing. In this course, students "focus on the practical skills required to identify and appraise best evidence to support nursing practice." A step in this process is searching the literature.

The library session takes place in Omaha, Lincoln, Kearney and Norfolk. Class sizes can reach up to 70 students. Each student is seated at a computer with Internet access. The session includes a lecture, which explains the concepts of searching and demonstrations of multiple resources, and a hands-on portion in which students search the resources for materials on their assigned topics. The material covered in the lecture is quite voluminous, and it is understandable the students may get overwhelmed. Additionally, efforts to lead the class in sample searches often leave students frustrated when they fall behind the group.

During the fall of 2014, a flipped instruction session will be instituted. Students will view a nine-minute module, which is a more precise version of the live lecture, interspersed with questions that serve as a self-assessment of the students' understanding of the material. The reduced lecture time and interactive elements make the task less passive, and students are expected to gain a greater understanding of search techniques.

During the classroom session, students will complete a structured and interactive tutorial that will guide them through the resources and reinforce concepts covered in the module. Following completion of the tutorial, students will be assessed on their comprehension of the content. The remainder of the session will be a workshop in which the students search for materials on their assigned topics, as well as a short demonstration on tasks such as finding full-text articles and citing sources.

The flipped instruction component meets the needs of contemporary students by focusing the instruction time on practical application. The self-paced approach will reduce the number of overwhelmed students and enable them to take control over their learning. An expected outcome includes utilizing library resources to find appropriate, evidence-based literature. The in-depth understanding will lead these students to have confidence in their abilities to find suitable resources and provide better care to their patients.

Promoting Partnerships Through Community Engagement

Project Director: Sara Brown, EdD, RN — College of Nursing
Project Members: Katherine Kaiser, RN, PhD, APRN-CNS — College of Nursing
Ruth Margalit, MD — College of Public Health
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Janice Tompkins, MPH, MT(ASCP) — School of Allied Health Professions
Suhasini Kotcherlakota, PhD — College of Nursing

Health professionals need skill development to prepare them to engage with diverse persons and populations in communities to reduce health inequities. The design of this module, specific for an inter-professional audience, will promote attainment of community engagement and social justice practices that will prepare UNMC learners uniformly for quality partnership work, during their education and in their future careers. Upon completion, participants will value what productive partnerships can garner for both themselves and the community as a whole.

This e-module allows students to garner a better understanding of what productive engagement with community members entails. Students can then be a champion for reducing health inequities and more profoundly work with people throughout the community. This module showcases current UNMC students, faculty, staff and community members who are engaged in community health efforts and showcases how they serve as collaborative partners. The module is succinct and applicable to all health care professional roles. It allows for asynchronous access, or can be utilized in a group/classroom setting. It allows the participants to connect with people and gain valuable insight to better partner with community members as a health care provider. It enables the participants to see health care from a different perspective; other than the traditional model. The module cultivates critical thinking about the community as a population and what can be done outside of office walls. Participants garner awareness of social justice and the community as a whole.

This module contains a personal cultural awareness assessment to determine current cultural humility. It also includes an online, interactive game "Spent" forcing the participant to make pivotal decisions regarding basic needs, housing and health care on a limited budget. In this game, you accept the challenge to test your ability to make it through a month on a limited budget; forcing you to think about how you would make these decisions when faced with the challenges of life. Several reflection tools are also utilized to echo how this content will be utilized by participants through their education and as future health care providers. The module also includes a community assessment tool, a case study and an example of a successful community engagement project. Participants of the module can ascertain this information from other students, faculty, staff and members of the community that are benefiting from these collaborations.

The Carnegie Foundation for the Advancement of Teaching (2011) defines community engagement as "the collaboration between institutions of higher education and their larger communities, for the mutually beneficial exchange of knowledge and resources in a context of partnership and reciprocity."

Community development work begins on a porch and not in a conference room. Historically, many decisions for vulnerable persons are made for them and not by them. A positive partnership empowers community members so that change can be made together. As representatives in academia it becomes our duty to promote health equity and social justice through partnerships between communities and academic institutions.

OTC Products for Insomnia, Urinary Incontinence, Cough & Cold
A Study of the Pedagogy of Video Learning

Project Director: Ally Dering-Anderson, PharmD, RP — College of Pharmacy

Project Members: Donald G. Klepser, PhD, MBA — College of Pharmacy

Teri Hartman, MS — McGoogan Library of Medicine

Dean S. Collier, PharmD, RP, BCPS — College of Pharmacy

Marcia Mueting, PharmD, RP — College of Pharmacy

Rory Sallach-Ruma, PhD, PharmD Candidate — College of Pharmacy

Jackie Smith, Research Assistant — College of Pharmacy

Kimberly Norman, MA — College of Pharmacy

These modules were designed to meet two very different needs. The first being the preclass work necessary to institute a flipped classroom design for this elective. The second being an opportunity to provide resources to our community pharmacy based preceptors. The grant was designed to allow for pedagogic research on these modules, compared with other forms of preclass work; to ask about student opinions of course material presentation; to review utilization of the videos by students who did not take the elective; and to review use by preceptors who wish to hone skills or get new product information.

Initial results indicate:

1. Students prefer audio to simple reading for preclass work in the flipped classroom setting.

2. The singular most important feature for students is the existence of a handout.

3. There is no difference between voice-over PowerPoint and video in learning or student satisfaction.

4. Students report preferring four 15-minute videos rather than one 60-minute video.

5. Test scores demonstrate preclass work with audio (video or voice-over PowerPoint) enhances short-term learning.

There are several results still pending, including: the utilization rate by students after the completion of the class; the utilization rate by students who didn't take the elective; and the utilization rate by preceptors in the experiential education program.

Pearls for future e-learning decisions include: assure understanding of all branding rules before the start of the project; voice-over PowerPoint is more flexible when drug availability and labeling change than video; and careful lesson planning is required not only for the e-learning modality, but also for the active learning component.

Particle Toss, the Physics of Radiation Interactions with Matter

Project Director: Joseph Driewer, PhD — College of Medicine
Project Members: Performed in collaboration with UNO IT Outreach

When learning radiation interactions with matter, students are often required to apply microscopic radiation physics concepts to macroscopic dose deposition problems. This abstraction is difficult and often frustrating. For this project, we developed an e-learning module to "gamify" radiation interactions with matter. Module users explore interaction theory through a Web-based HTML5 interface (Adobe Edge Animate) and apply those concepts in an interactive game (Unity Gaming Engine) that involves throwing particles at a designated target. The game has a goal of destroying a select target while minimizing damage to surrounding tissue given a limited number of resources and a limited amount of time. The module facilitates conceptualization of the issues surrounding particle type, energy, direction and dose deposition. The module can also be utilized in a flipped-classroom model, freeing class time for design-oriented challenge questions and problem-based instruction. Screen shots are shown below. We anticipate the game will enhance retention and critical thinking in radiation therapy planning applications. Furthermore, familiarity with new design tools such as Edge Animate and Unity will allow us to incorporate more animation and interaction into our teaching in the future.

Screen Shots from HTML-Based Portion of the Module
The primary purpose of this section was to explain and animate microscopic interaction concepts. The interface is designed to fit on tablet computers and be accessible via the Web.

Screen Shots from a Beta Version of the Game
The object is to destroy a target while sparing the surrounding environment given a limited number of resources. Students will be required to make choices on particle type, energy and direction based on target depth and location. Limiting the resources and time enhances the gaming aspect.
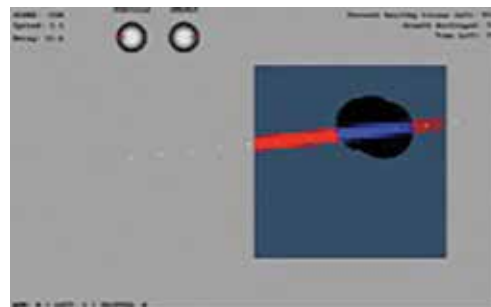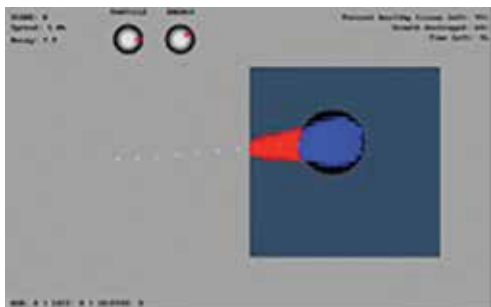
Mechanical Ventilation

Project Director: Charity H. Evans, MD, MS — College of Medicine
Project Members: Geoff Talmon, MD — College of Medicine
PJ Schenarts, MD — College of Medicine
Keely Buesing, MD — College of Medicine
James Sullivan, MD — College of Medicine
Allison Hunt — Graduate Student, Instructional Design, UNL

Introduction

"Mechanical Ventilation" is UNMC's comprehensive evidence-based online curriculum for mechanical ventilation. This 16 module online course covering basic and advanced mechanical ventilation teaches students how to think algorithmically about the mechanical ventilator, and to solve problems efficiently. Module topics include: respiratory physiology, initiating ventilation, mode of noninvasive and invasive ventilation, monitoring, patient-ventilator interactions, weaning, complications and adjuncts, and advanced mechanical ventilation.

Improved Retention and Application

Mechanical Ventilation promotes better retention and application of course material by providing the learner with module objectives, PowerPoint presentations with scripted voice-over, stop points in each module that require the learner to interact with the content, summary of key points and links to additional resources. By providing the learner with a comprehensive and stackable curriculum, the learner is able to better apply the newly acquired knowledge to daily clinical practice.

Learner Control and Investment

The modules build on each other, starting with basic concepts then progressing to advanced topics of mechanical ventilation. The student must complete the first module before progressing to the next. This format allows the learner to progress at their own pace. The modules are available on Blackboard, and are accessible on a desktop computer, iPad or smartphone. This provides the learner with ample opportunity for learning inside and outside the classroom.

Use of the Flipped Classroom

The eCurriculum will be assigned to residents on Acute Care Surgery and Critical Care medicine during a one month rotation. These services are covered by General Surgery, Anesthesia, Family Medicine, Internal Medicine and Emergency Medicine residents. Residents will be assigned four modules a week, along with one hour of Flipped classroom time. The Flipped classroom will be used to cultivate critical thinking through small group activities with faculty, case presentations, and review of laboratory studies and imaging.

Assessment Tools

Every module has a five-question pre- and posttest. The pretest assesses the student's baseline knowledge through fact based questions. Posttest questions were inspired by real-world patient scenarios, and examine the student's ability to apply the knowledge and think critically. After completing the online curriculum, the student will participate in a patient simulation in the Simulation Lab at UNMC, and be required to apply knowledge learned during the curriculum. There is standardized grading for the simulation experience.

Response to the Contemporary Learner

Contemporary learners prefer active learning. By placing engagements in each of the modules, the learner is required to interact with the material online, in a self-evaluative manner. Each module was written by a faculty intensivist, and includes real-life patient scenarios for the student to learn from, thereby providing relevance. The Flipped Classroom curriculum is collaborative, and informal, allowing the learner to interact with faculty. Lastly, by targeting residents who are currently rotating on our services, we as faculty show interest in their knowledge and progression.

Pathophysiology of Headache

Project Director: Paul D. Larsen, MD — College of Medicine
Project Member: Ben D. Greer — College of Information Science and Technology, UNO

The purpose of this module is to enable students to understand important basic concepts about headache. The module is divided into three parts which include: the anatomy of pain pathways, classification of headache, and the pathophysiology of migraine.

The target learners for the module are second year medical students in the Neurology core, but this module can be used as a free standing tutorial by learners at any level of training or practice. The module is designed for individual learning but sections of the module can also be used in the classroom to focus on important concepts and demonstrate anatomical pathways and the pathophysiology of migraine. There are 10 concept sections and three quizzes throughout the module. The quizzes are six to eight questions each and are designed to help the student understand the concepts. The student must answer each question correctly to be considered competent and to progress to the next part of the module. The total module is 15 minutes long; not including the time spent taking the quizzes.

The module is designed to enhance the understanding and retention of the concepts presented. The module is developed in FLASH animation and visually demonstrates the concepts discussed. Besides sequential progression there is also a menu bar that allows the learner to select and review any section.

Technical features of the module include the options for part and full screen viewing, close caption, and a pause and start button. The module is designed to be an open access Internet site.

The inaugural use of the tutorial will be 2015 as part of the MS II Neurology, Ophthalmology, Psychiatry core. Traditionally, the students have attended a lecture on Headache. This year the students will be required to view the module prior to class. Class time will then be spent not in a lecture but as an interactive session focusing on thinking with and building on the concepts they have learned from the module to solve clinical cases. There will be a combination of written case scenarios, patient cases on video and a live patient. This process is designed for retention as the students actively apply what they have learned.

Diagnosis of Renal Neoplasms

Project Director: Subodh M. Lele, MD — College of Medicine
Project Members: Lauren Murer, MD — College of Medicine (Collaborator)
Amber Donnelly, PhD, MPH, SCT (ASCP) — School of Allied Health Professions (Reviewer)

One of the hurdles in studying medicine is remembering and understanding the enormous amount and complicated nature of facts required for practice. Historically, it has been shown studying such material in a case-based format helps in its understanding and retention.

Therefore, in this e-module, 10 cases were designed to illustrate 10 different renal neoplasms. Gross images of resected tumors, scans of imaging studies, videos of microscopic pathology and slides using animation to explain molecular pathways were utilized. The cases were presented such that the reviewer was quizzed to select the most appropriate response. Each response (correct and incorrect responses) had detailed explanations highlighting differential diagnostic features using additional images/videos/animation as required.

In this module, solving the cases using a "multimedia" approach with explanations for incorrect responses helps in retention and application of course material. The module can be accessed from anywhere and anytime, allowing students to have more control of their learning. Review of the material before a live class session helps in developing critical thinking skills. The multimedia approach relates to the contemporary learner and also provides for better archiving of information with easy access for future reference.

Introduction to the Trauma Patient

Project Director: Jyoti Mahapatra, MD — College of Medicine
Project Members: Michael Wadman, MD — College of Medicine
Richard Walker, MD — College of Medicine

This module was developed for the College of Medicine first and second year medical student Integrated Clinical Experience, ICE, lecture series. Its intended goal is to transform the ICE lectures from a traditional format into a flipped classroom. Because these lectures are in addition to the core medical student curriculum and typically led by clinical faculty, they provide the opportunity to introduce a novel educational concept. The desired objectives are enhanced student autonomy with self-study, clinical application of basic science principles, increased team-based and critical thinking during lecture periods, and improved integration of lecture content into clinical practice.

Trauma patient evaluation and management provides a unique clinical environment where multi-disciplinary teamwork and systematic, repeated evaluation is essential to treatment of acute, life-threatening conditions. Physicians from emergency medicine, surgery, orthopedics, pediatrics, anesthesia and neurosurgery must all work in cooperation to thoroughly and quickly evaluate patients for frequently occult, potentially devastating injuries. This also requires supervision of multiple ancillary staff such as nursing, technicians and EMS personnel. Physicians leading a trauma evaluation must oversee multiple simultaneous actions and respond immediately to abnormalities in a patient exam, vital signs, lab results and radiographic imaging to avoid clinical decompensation and potentially irreversible morbidity and mortality.

This environment exemplifies several critical concepts in clinical medicine in a high-acuity, fast-paced, dynamic setting that is thrilling and very memorable for students during their early, formative years of medical education. This module was developed to maximize the opportunity the trauma evaluation holds for clinical application of human anatomy and physiology, pharmacology and procedural skills. It was created with PowerPoint and Articulate, and included custom illustrations, voice narration and a simulated trauma patient video. It is concluded with several multiple-choice questions that underscore key concepts and can be used to assess retention and ensure module completion.

After students had completed the module on their own, classroom time was used by clinical faculty to present several patient scenarios using simulation mannequins. Patients' initial exam and vital signs were altered in response to student actions for a given chief complaint. Student attendance and participation was a record high and both the module and simulations were very well received.

Moving forward with utilization of this module, pretest as well as postmodule completion tests will be provided, and we anticipate further methods of measuring student retention and application of basic principles in clinical practice. There are currently several other ICE topics we hope to develop modules for, that will be equally well-received and a valuable use of the limited hours of a medical student. In our case, the trauma module certainly met its goal of a flipped classroom format improving lecture attendance and use of class time to practice team problem-solving, critical thinking and improved patient application of medical education.

Invasive Pressure Monitoring: Arterial and Intracranial

Project Director: Connie Miller, PhD, RN — College of Nursing

Arterial Project Members: Suhasini Kotcherlakota, PhD — College of Nursing

Patrick Rejda — College of Nursing

Intracranial Project Members: Suhasini Kotcherlakota, PhD — College of Nursing

Andrea Evans — College of Nursing

Patrick Rejda — College of Nursing

These online modules contain video with audio explanation of the psychomotor skills necessary for safe care and management of the invasive arterial and intracranial pressure monitoring devices.

Each video can be accessed through Blackboard at a time and place convenient for the learner. Basic knowledge attainment quiz questions are embedded in the module so learners are able to assess their knowledge attainment as they progress through the module. They can answer the quiz questions as many times as they wish in order to achieve the required score. After receiving 80% on the required final quiz, they will then demonstrate the procedure under faculty supervision. Just-in-time skill attainment in the module using an application for mobile devices called, Aurasmus.

This emerging technology, along with the online module, will support correct procedures during independent practice as well as safe care in the clinical environment. This module fills a gap in available resources for this complex skill.

Fine Needle Aspiration Technique

Project Director: Maheswari Mukherjee, PhD, MS, CT (ASCP)^{CM} — School of Allied Health Professions

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The Cytotechnology program of UNMC is known to utilize cutting edge technologies. Our program has incorporated virtual microscopy technology as an adjunct resource since 2010. Our program also provides each student with a touch screen computer monitor connected to the Internet and an iPad. In addition, our program is a leader in distance education. Our distance learning program has three approved satellite sites: Carle Foundation Hospital, Urbana, IL, University of California Davis Medical Center, and Ohio State University Wexner Medical Center. Currently, our program is building a complete online educational curriculum using virtual microscopy which will eventually help training entry level cytotechnologists across the United States and internationally. Part of this effort is the development of e-modules for creating a complete online educational curriculum. With that objective in mind, an e-learning module, "Fine Needle Aspiration Technique," was developed using "Articulate" software. This e-module consists of video clips that provide an overview of the fine needle aspiration (FNA) procedure; demonstration of patient interaction, preparation and staining of the glass slide specimens, and evaluation of specimen adequacy assessment. The expected outcomes of this e-module are the improvement in the health professional students/residents understanding of the FNA technique, and the role of interdisciplinary health professionals in the FNA procedure.

This e-module can be viewed in any mobile multimedia technology, such as an iPad or iPhone, without using special software. In addition, students can view it multiple times in and outside of the classroom at their own pace, thus providing them with more control and investment in their learning. Moreover, instead of a traditional lecture, visualizing the scenario of the FNA procedure will promote their better understanding of the course material as well as a clear idea of what is expected from the health care professionals in a FNA procedure. This may, in turn, prepare the students as better health care practitioners.

In spring 2015, this e-module will also be used as part of a flipped classroom. The students will be asked to view the e-module prior to the class. A wide variety of activities will be given to the students in the classroom which includes but is not limited to: asking the students to quiz each other; do a role play of the interdisciplinary health professionals in an FNA procedure; and, develop case scenarios in which FNA procedure is required. These activities are expected to cultivate critical thinking in the students.

The purpose of assessments that are part of the e-module and the flipped classroom activities are to evaluate the ability of the health care professional students/residents to define the FNA technique, list the indications of FNA procedure, list the advantages and the disadvantages of the FNA procedure, describe the role of interdisciplinary health professionals in an FNA procedure, demonstrate the specimen smearing techniques on the glass slides, demonstrate the different steps involved in staining the glass slide specimen, and describe the specimen adequacy. These assessments will be done by means of multiple choice questions and multiple response questions.

The purpose of the survey at the end of the flipped classroom activities will provide the educators a better understanding of the perception of health professional students/residents about the flipped classroom and the e-learning methods.

Biostatistics Primer

Project Director: Kendra Schmid, PhD — College of Public Health
Project Member: Gary C. Yee, PharmD, FCCP, BCOP — College of Pharmacy

Biostatistics concepts are important topics for future health professionals and researchers that are often lacking in health professions curricula, biomedical graduate programs and post-graduate training programs (i.e. residencies and fellowship programs). Curricula for these programs are already full without room to add additional courses, although the importance of understanding biostatistics concepts has been recognized on campus.

Five e-modules introducing common concepts in biostatistics were designed to serve this purpose:

1. Summarizing Data

2. Study Design

3. Variability

4. Risk

5. Statistical Inference Basics

These topics were selected based on their wide applicability to programs and are designed to be used in any combination ranging from one module to all five.

This series of modules can be used in whole or in part during a semester course or as additional training not included as part of a formal course. The modules themselves contain biostatistical concepts and examples, along with links for interactive tools or games and skills check questions to assess understanding. Each module also has a practice problem set that can be used for additional concept reinforcement.

The e-modules incorporate interactive components and provide multiple opportunities for the user to enhance their experience and deepen their biostatistics knowledge and skill set. Examples include virtual flashcards, videos, demonstrations, calculators, quizzes, links, and alterable graphs and visual aids. Each e-module can be used with a flipped classroom. Some case studies are developed; other classroom activities or discussion topics can be determined by the subject matter faculty.

Bedside Procedure E-Module Series

Project Directors: Christopher J. Smith, MD — College of Medicine

David Gannon, MD — College of Medicine

The Advanced Clinical Skills Team is group of faculty dedicated to teaching procedural skills using high-fidelity simulation. To enhance these training sessions, we developed a series of five e-modules to enhance procedural training. The five e-modules are:

1. Pre-procedure

2. Paracentesis with ultrasound guidance

3. Thoracentesis with ultrasound guidance

4. Lumbar puncture

5. Central venous catheterization at the internal jugular and subclavian vein sites with ultrasound guidance

The pre-procedure module discusses details of attaining informed consent, performing a time-out, use of sterile precautions and appropriate procedure documentation. The procedure specific modules cover indications, contraindications, complications and fluid analysis specific to each procedure.

These e-modules will be used in a flipped-classroom approach to procedure training, with a focus on didactic content, rather than on procedural demonstration. This approach will allow for content standardization and maximization of hands-on classroom experience with simulation models. This e-module series will be used in several courses, including:

1. Annual training for Internal Medicine and Medicine-Pediatric resident

2. Annual training for senior medical students (M-ID-710 Senior Seminar Series)

3. Procedure-based clerkships for junior and senior medical student

4. Faculty development for maintenance of competency in bedside procedures

5. Opportunity to expand to other training programs, including Family Medicine, advanced practice nursing, and physician assistant

Clinical Anatomy Learning Modules

Project Directors: Ryan Splittgerber, PhD — College of Medicine

Carrie Elzie, PhD — College of Medicine

With growing technology, a new generation of learners and an increased need to educate globally, we are seeing a shift in pedagogy to a more interactive learning environment within medical education. Based on the Socratic method, this pedagogy employs both online and classroom strategies to reinvigorate the learning process for faculty and students. To help ease the burden of limited class time and the expanding amount of medical knowledge, we have created several anatomy, interactive, e-learning modules as a mechanism to better prepare entering medical and allied health students.

A series of 10 modules covering introductory systems anatomy was created using Articulate Storyline and InVivo software. Each module is 10 to 12 minutes long and will be used by entering medical, physician assistant, physical therapy and high school students. Anatomical information is conveyed through voice-over, images, animation and/or videos. Multiple assessment checkpoints using quizzes and drag-and-drop functions were built into each module to ensure mastery of concepts. Modules will be used by the entering classes this fall.

As a result of our funding for the initial anatomy modules and through the excitement of learning a new software program we have generated two spin-off projects of a similar format. Instead of lecture material, we have built e-learning modules to serve as laboratory guides in both neuroanatomy and histology for medical and graduate students.

Neuroanatomy Labs

- 7 modules, one for each lab

- Modules completed and were used by the medical students this past spring semester in the Neuroanatomy Core 4 Course

- Modules were used as lab preparation and as a guide for students dissecting in lab

- 80% of students were "very satisfied" with the labs

- All students surveyed suggested similar modules be adopted for either gross anatomy or histology

Histology Labs

- 17 modules, one for each lab

- Half the modules are completed, the remaining half will be completed by the end of the summer

- Modules will be used this fall and the following spring for medical and graduate students

- Modules will serve as preparatory material for team-based learning lab sessions

- Student feedback on pilot modules is currently being collected

- A focus group has also been completed

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