

Innovators in Education

Elevating health science curriculum
to new heights

Volume 4





H. Dele Davies, MD, MS, MHCM

Vice Chancellor for Academic Affairs

This year has seen significant strategic growth for the E-Learning Program, particularly regarding integration into our health science curricula.

Our third cohort of 27 student innovators were tasked to create e-modules in three predetermined areas: biology of disease, pharmacology, and pathophysiology. These areas had been identified by faculty as challenging, interprofessional topics that were often difficult for students to master. Student innovators, working under the direction of their faculty advisors, developed engaging, interactive ways to convey this information in a method that was easier for their fellow students to understand.

By narrowing our focus to topics that cross multiple disciplines and colleges, we can ensure the projects have a greater impact on outcomes and the number of learners reached.


Highlighting the continued importance and relevance of e-learning to students, innovators from previous student cohorts are staying engaged in e-learning by volunteering to serve as project consultants, offering software assistance and peer review to new student developers.

A third cohort of faculty innovators are also completing their projects. These two-year long curricular redesign projects required extensive planning and development to incorporate substantial active learning components into entire courses using a variety of e-learning, simulation, flipped classrooms, blended learning, and other modalities.

It is important to note the participating colleges committed matching funds to support the redesign of these courses. This is further testament to the growing support of e-learning across campus.

This curricular redesign will allow us to discover how learner experience changes with the incorporation of e-learning into the classroom environment.

I want to express my gratitude and appreciation for all the hard work that went into the creation of these e-learning projects, and I hope you enjoy learning about how our students and faculty are elevating our curricula to new heights.



Access the Student Modules on the E-Gallery

UNMC students and faculty can access e-learning modules on the E-Gallery at unmc.edu/egallery.



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College of Allied Health Professions


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E-Learning Leadership

External Advisory Board



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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, 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.



Nicholas Lorenzo, MD, MHCM, CPE

Founder, CEO and Chief Medical Officer of PHLT Consultants,
Chief Medical Officer at MeMD Inc.

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 served as the Co-Founder and Chief Publishing Officer of eMedicine (acquired by WebMD), the Founder and CEO of Pearlsreview (acquired by Gannett), and he was a Senior Founding Contributor to Boston Medical Publishing (acquired by McGraw-Hill). eMedicine and Pearlsreview, even today, are two of the largest and most extensive electronic/online health care education and publishing systems in the world. Currently, Dr. Lorenzo is the Founder and CEO of PHLT Consultants, and he also serves as the Chief Medical Officer of MeMD, a Scottsdale, Arizona based company, that provides telemedicine services across the US.



Ray Schroeder

Associate Vice Chancellor for Online Learning at the University
of Illinois, Springfield

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.

E-Learning Leadership

Steering Committee Members

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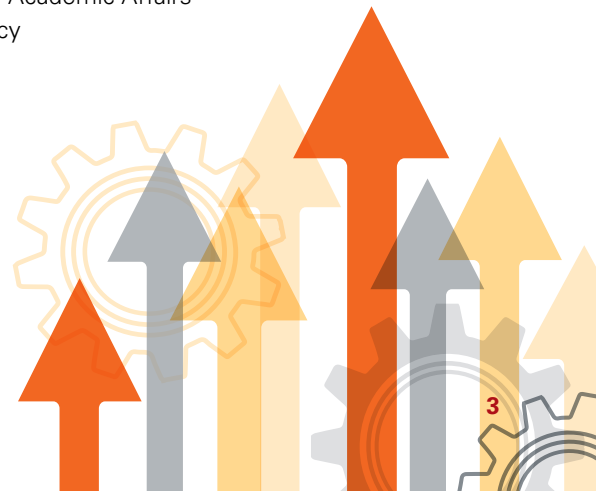
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Student-Led Project

Effects of Acid-Base Status on Drugs Distribution

Student Director:

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College of Medicine
Class of 2019

Student Member:

Thomas Enke

College of Medicine
Class of 2019

Student Consultants:

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College of Medicine
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Michael Visenio

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Faculty Advisor:

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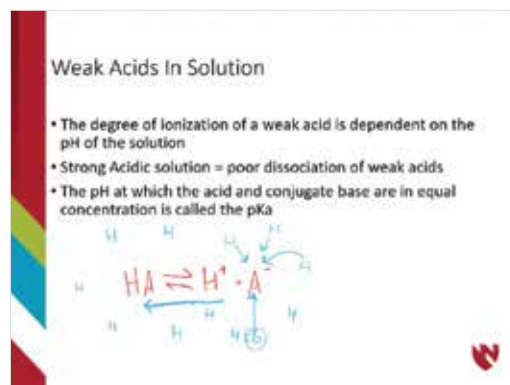
The overall goal of this e-learning module is to provide students with a resource that combines multiple learning modalities into one succinct introduction into acid-base pharmacokinetics. The information included provides a foundation for students engaged in health care education. Pharmacology is becoming an increasingly integral aspect of health care for providers and understanding the basic mechanisms is necessary for further mastery.

The module is designed to engage the learner in passive and active learning as they are walked through various slides, diagrams and graphics. The information is broken down into two bite-sized sections. Each section begins with an introduction by an audio script that explains in-detail the on-screen information. The introduction is then followed by illustrations to build upon the newly introduced topics.

Both sections conclude with a quiz including short answer, multiple choice, and matching questions to ensure mastery of the content. The module encourages students to self-assess their knowledge with options to return to earlier lessons for further instruction before moving forward. Upon completion of the content, students will be prompted to complete a final quiz that combines all information of the module.

This project targets a broad spectrum of learning techniques by incorporating interactive assessment with audio and visual lessons.

Due to the brief nature of the module, it can be used by students as they work through their course work, but also as a fundamental review for licensing exams and continuity of education.



Student-Led Project

The Mechanics of Breathing in Obstructive and Restrictive Diseases



This module explains how obstructive and restrictive lung diseases alter the mechanics of breathing with the goal of helping the learner understand the common clinical presentations of the two categories of diseases. Pathological changes to factors involved in pulmonary mechanics, such as compliance, elasticity and airway resistance, are explored. Understanding the altered mechanics in lung disease enables the future health care professional to better assess and treat pulmonary patients.

After an optional anatomy review of the pulmonary system, the learner navigates through the media-rich and interactive educational content made with Articulate software at a self-selected pace. Checkpoint questions are embedded at the end of each new concept to facilitate learning. The module concludes with case studies for application of the material to clinical practice.

The module is useful as a pre-class activity or stand-alone learning opportunity. Learners will find it helpful in mastering foundational pathophysiology concepts, as well as reviewing the same concepts in applied clinical science courses.

In short, the module uses engaging technology to educate future health care professionals on the mechanics of breathing in restrictive and obstructive lung diseases.

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College of Allied Health Professions
Class of 2018

Student Member:

Audreana Aguilar

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Student Consultants:

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College of Medicine
Class of 2017

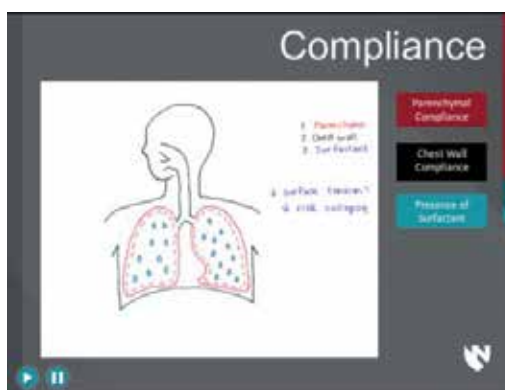
Austin Svec

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Student-Led Project

Thyroid Droid

Student Director:

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Student Members:

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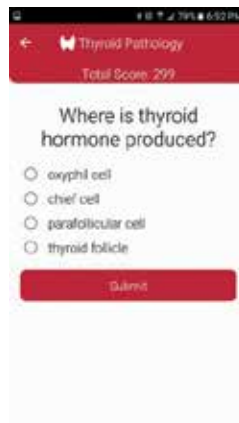
Our e-learning project focuses on thyroid pathology, an important subject covered in the Biology of Disease course taught at the College of Allied Health Professions. We chose Biology of Disease because it is a multi-disciplinary course, and we wanted to build a module that would serve the widest range of students possible.

Our module helps students retain what they learn by regularly checking for student comprehension. After every lesson (approximately one minute of reading), the student is prompted to take a brief quiz. The quiz is not marked as complete until every question has been answered correctly. If a question is answered incorrectly, the student is directed to the specific part of the lesson that the question references.

The project is also unique in that it awards points for correctly answered questions. This “gamification” is intended to motivate the learner to successfully complete as many lessons as possible in order to be seen on the leaderboard, which displays the top five users. The point system is also intended to serve as positive reinforcement as the student progresses through the lessons.

When students feel comfortable with the material, they have the option of completing case-based questions. These additional questions are designed to challenge the student to integrate all they learned in the previous lessons in order to solve real-world clinical problems.

As students use the module, we will be able to view which lessons are less effective by calculating the average scores of the quizzes for each lesson. Those with particularly low scores will be redesigned to help the student better comprehend the material.



Student-Led Project

Overview of the Immune System



Immunology is one of the topics covered in the Biology of Disease course, which is a required class for several programs at the University of Nebraska Medical Center.

For students that have never taken an immunology course, the subject matter can be confusing and appear abstract. Not having a basic understanding of immunology could lead to the misunderstanding of not only the immune system, but other aspects of the human body.

This e-module engages the learner using interactive elements in tandem with visual and audio stimulation.

The information in this e-module follows highlighted classroom material, which includes basic components and functions of the major histocompatibility complex and hypersensitivity reactions.

Learners will be able to interact with immunologic components, while simultaneously receiving feedback to questions for a more hands-on approach. This e-module will be used as supplementary material that will bridge the gap between the classroom and textbook.

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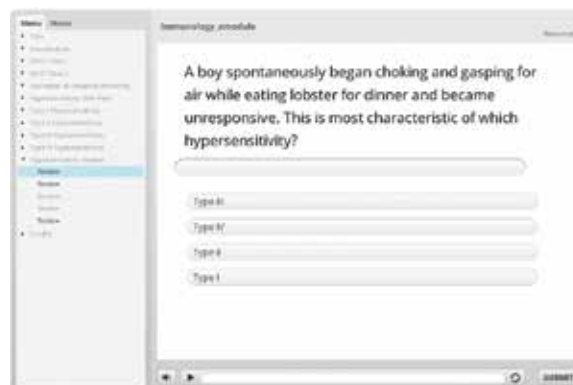
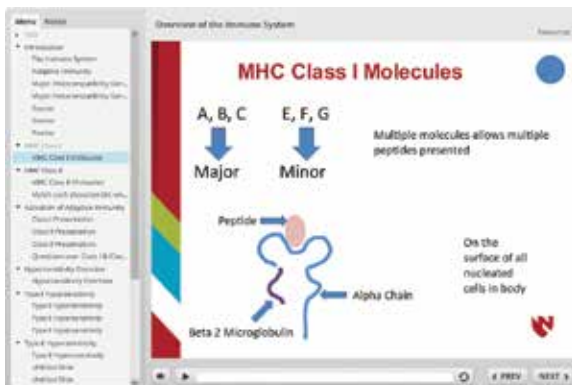
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Student-Led Project

The Sugar-Coated Truth of Diabetes

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The main goal of this module is to educate students on the basic aspects of the increasingly prevalent disease: diabetes. Diabetes is a topic that has surfaced in many of our courses throughout our curriculum. However, there are still many aspects to the disease that students often find confusing regarding the basic pathology underlying the disease. We believe this module will help define core concepts essential to understanding diabetes and its effects on several body systems.

Our module uses animated videos to inform students about the key differences between Type 1 and Type 2 diabetes, the pathology underlying the systemic effects of the disease and to provide patient education regarding the management of this condition. The learner will participate in embedded quizzes and clickable interactions to enhance retention of the presented material.



The treatment of diabetes is multi-disciplinary and this module could be implemented into the curriculum of several programs to create a common understanding of diabetes among future health care providers, in order to achieve a common goal of providing the best patient care possible.



Student-Led Project

Beating Cancer for Biology of Disease



This interactive e-module is designed to supplement neoplasia-related content as taught in the Biology of Disease (BOD) course at UNMC. It is intended to give the user the freedom to learn challenging material at their pace. Rather than following a sequential, pre-determined course, it allows the user to choose what to complete first.

We have created an interactive main menu, designed to mimic a patient room. From the main menu, the user, playing as the patient's clinician, can navigate through the module, with the goal of completing the module to "save the patient." The main menu is highly interactive. Users can change their character, click on their surroundings, and hear the various sounds of a real hospital.

Within the main menu, there are links to the four sections in the module. These sections correspond to the key areas covered in the lectures over neoplasia as taught in the BOD course. These sections cover material over key terms, benign versus malignant tumors, carcinogenesis, and metastasis. Each section has a small, 4-5 minute module explaining central concepts. At the end of each section, a short quiz must be completed to continue. Once the user successfully finishes each quiz, he or she will receive a letter of the "patient code." The code letters received from each of the four quizzes can be kept track of within the "checklist," an item within the main menu where students can chart their progress. Once the user completes all the quizzes and receives each of the four "patient code" letters, they can enter the code at the end of the module to "save the patient."



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This module combines different methods of learning, including audio, pictures, mnemonics, and hand-drawn video explanations. It was our goal to create an environment that could be played uniquely by each user. All the while, we comprehensively present the content necessary for learning neoplasia-related material.



Student-Led Project

Antibiotic Resistance in Transitional Care

Student Director:

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Class of 2017

Student Members:

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Older patients receive health care in multiple settings where it is common to acquire resistant infections, especially urinary tract infections (UTI). Management of these complicated, health-care acquired UTIs requires interprofessional collaboration between providers including APRNs and PharmD pharmacists as well as the utilization of evidence-based guidelines for the best antibiotic and treatment approach.

The module has been designed to help the learner apply the principles of evidence-based antibiotic management in transitional care. Learners will use a case study with branching points for the major treatment decisions. Students follow a treatment choice to its conclusion.

The module will be used in PHPR 674 and NRSNG 606 to assist students to learn to work together on pharmacotherapeutics. Students have the opportunity to participate in the module in interprofessional groups, which encourages interprofessional collaboration and problem solving.

Short questions throughout reinforce key learning points. There is also feedback for branching decisions that might be harmful or not therapeutic to the patient. The e-module will utilize pre- and post-tests including an interprofessional team simulation training assessment tool for knowledge learned and team behavior perceptions. Successful completion of the module will result in higher accuracy and improved team perceptions post-test.

This project was designed to respond to contemporary learners and help develop a better-prepared health care professional. It offers links to evidence-based guidelines and tools that aid pharmacists, nurse practitioners, and other providers to make safe and effective decisions. The branching points support the use of current treatment guidelines and reinforce the importance of interprofessional collaboration.

In medicine, there is frequently more than one right answer. The student gets the opportunity to make a decision that will lead to a better outcome. Allowing students to make decisions using evidence will aide learners to integrate pharmacological interventions into clinical situations and thereby increase integration of information for future practice.

Student-Led Project

Drugs of the Autonomic Nervous System

Pharmacology is a key course for medical and pharmacy students, and the pharmacology of the autonomic nervous system (ANS) is a major component of this course.

However, ANS pharmacology is a difficult subject for many students because it requires a working knowledge of autonomic anatomy, physiology and biochemistry; students may not have an adequate background in these topics, or they may not have retained this information from previous courses to master ANS pharmacology in the relatively short period of time devoted to this topic. In addition, there is a long list of drugs students are expected to know.

We believe that our engaging videos that include live drawings (the same style as Khan Academy videos) will promote learning in addition to the quizzes interspersed with our modules. The lengths of the videos interspersed between quizzes is on the order of a few minutes, which we think will help students get the most out of our modules.

We have also created aids to memorizing the many drugs that are covered in the course, which will hopefully be used by students for the tests in the class but also for long-term retention.

The project will be used in conjunction with Dr. McMillan's lectures in future medical and pharmacy classes to help students retain the knowledge from lectures.

Student Director:

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Student Members:

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Valery Tran
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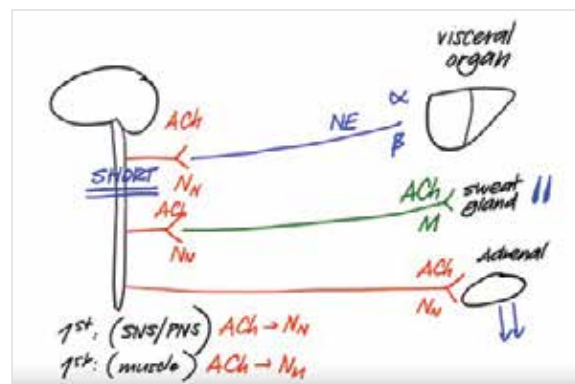
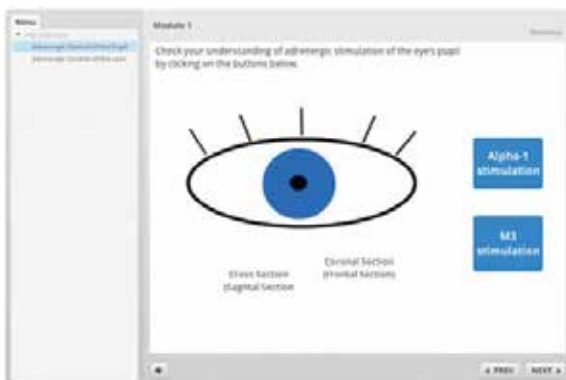
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Student-Led Project

Cardiac Supply and Demand

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Student Consultants:

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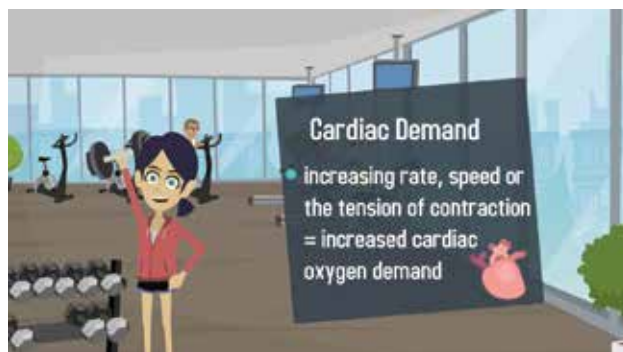
College of Allied Health Professions

The topic of cardiac oxygen supply and demand was chosen for this e-learning module because these concepts are the building blocks in understanding the pathophysiology of cardiac conditions. Students can utilize this module as a preview or review of cardiac oxygen supply and demand fundamentals.

By understanding the basics of this topic, the student is more prepared for lecture material focused on higher order learning objectives.

This module promotes retention and application by using images, audio and interaction that can be completed at a student's individual learning pace. The software used was Articulate Storyline, which allows the learner to visualize the concepts of cardiac supply and demand through avatars, anatomical images, and narration. The students can also gauge their understanding of the topic with short quizzes and feedback provided throughout the module.

To further ensure comprehension, the end of the module provides opportunities for the students to apply what they have learned to clinical cases involving cardiac conditions due to an imbalance in cardiac oxygen supply and demand.



Faculty Curricular Redesign Project

Simulation of Workplace Walkthroughs



In this project, we animate common processes that occur in a manufacturing facility. These processes include electroplating, welding, annealing, and packaging and shipment of the final product. The purpose of the project was to show students the processes, the work practices, and the potential hazards experienced by workers, and ways to control these hazards.

The project was primarily designed for online students who may not have the opportunity to visit a manufacturing facility. For in-class students, this animation helps them understand what to look for during a visit to a manufacturing plant.

We anticipate these students are better prepared to ask insightful questions to plant managers because they are educated on the processes, industrial terms, and controls prior to visiting a workplace. During classroom discussions (online and in-class), students will also gain an appreciation of economical factors that decides what controls a company chooses to implement to protect worker health.

In Fall 2017, we will assess the impact on learning through a questionnaire administered before and after they watched the animation.

Students in the environmental and occupational discipline will be able to critically assess hazards in a workplace. This in turn will lead to better decisions on how to measure workplace exposures, and eventually prevent workplace illnesses.

Project Director:

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Project Member:

Zachary Fowler, MS
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& Technology, UNO

Both online and in-class students were asked to provide informal feedback; students liked the animation, the additional notes posted on screen, and information on hazards and controls that pop up throughout the animation. Assessment questions were provided after each section to strengthen understanding.





Faculty Curricular Redesign Project

Case-Based Interdisciplinary Team Approach to Treatment Planning

Project Director:

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Nagamani Narayana, DMD, MS
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Sheela Premaraj, DDS, PhD
College of Dentistry

Myhanh Phan-Rinne, DDS
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Sung Kim, DDS
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Julie Marshall, DDS, MS
College of Dentistry

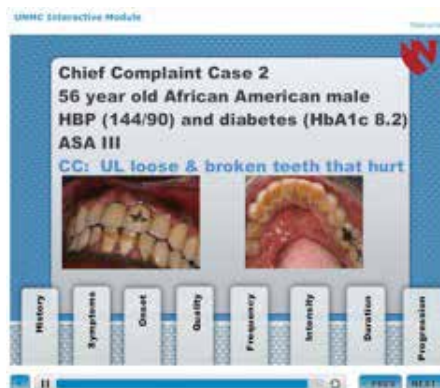
Dental treatment planning is one of the most complex and important aspects of comprehensive patient care. It requires a solid foundation of didactic information and critical thinking skills to format a sequential dental plan that is accepted and chosen by a patient.

The shift from classroom and preclinical laboratory to live patients in a clinical setting is often daunting to students. This topic was selected to give students interdisciplinary modules to help support the transition from classroom to patient care. Students may study a topic or procedure several months prior to applying it to a clinical patient. Students will be able to review the interactive modules and videos of the anticipated clinical procedure immediately before needing it in clinic.

This module allows students to learn the material at their own pace. Embedded videos provide demonstrations for clinical skills. The material will be available as a reference source to review as often as needed until clinical competency is achieved.

The modules are available on Blackboard for students to view. Students may view the interactive material prior to class discussions or attend class time designated for viewing the modules. The material is reinforced for improved retention and application through case discussions during scheduled class time.

Students' use of the modules outside of class and feedback for quality improvement will be analyzed. Ideally students will feel more comfortable and gain clinical confidence more rapidly with these resources. Students have indicated that the opportunity to learn at their convenience is one of the best aspects of e-learning modules.



Faculty Curricular Redesign Project

Enhanced Active Learning in the Anatomy Curriculum



Historically, the Genetics, Cell Biology and Anatomy department has provided a robust active-learning environment. We saw an opportunity to take advantage of new teaching methodologies to address challenges faced with teaching more students with less time and staff, while also maintaining the amount and quality of the active learning in our curriculum. The project included:

- / Development of a comprehensive “one-stop shop” for gross anatomy Interactive Dissecting Guide that also serves as a navigation pane to the multitude of resources available for self-directed learning. Students customize their learning by choosing resources that best match their learning style and needs.
- / Creation of a series of video modules that teach students how to find and palpate bony prominences in preparation for performing a physical exam. Students view the videos prior to coming to class so class time may be used for discussions with faculty and to receive immediate feedback on performance.
- / Production of interactive radiology modules that introduce the students to different radiological modalities and enable students to relate the anatomical knowledge learned in class to interpretation of those images. Application of newly acquired knowledge enhances long-term retention and low-stakes quizzes incorporated into the modules serve as formative assessment.
- / Construction of an e-learning module that was used by M1 Neuroscience Core students for self-directed review of neuroanatomical structures.
- / Employment of “Draw It to Know It,” a comprehensive, clinically relevant, active-learning tutorial for learning components of neurosciences. This product helps students learn concepts that are difficult to convey in a lecture format.

Project Director:

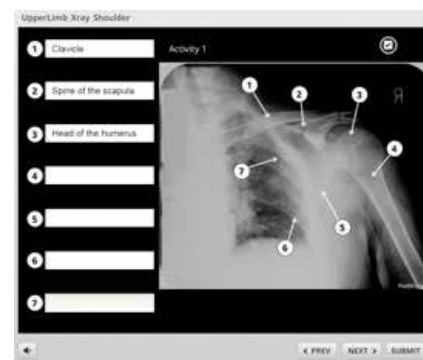
Carol Lomneth, PhD
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Students identify the bony landmark then type in the correct term in the appropriate blank. Incorrect spelling is not accepted.

Faculty Curricular Redesign Projects

Case Study-Based E-Learning Modules Utilizing the Anatomage Virtual Dissection Table and InVivo5 Software: Is It Effective in the Blended Learning Environment?

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A combination of a virtual dissection table, unique case studies, and interactive radiology images provided the foundation for creating 53 modules. In creating the modules, the authors' goal was to use case study-based pedagogy to provide a comprehensive means to review anatomy, teach pathology, and improve critical thinking for health professions students. The literature supports the use of case study-based learning as an alternative method to teach material that may otherwise be dry and routine. Case-based learning also assists the learner in bridging the gap between simply memorizing facts to applying the knowledge in the clinical setting.

The modules are designed to be added individually to various health professions based courses or to be completed as part of a newly developed, completely online course. To date, the modules reside in 16 different courses including undergraduate, graduate, and professional development. Applications include:

- ✓ A means to introduce a new knowledge base to students prior to class as part of a flipped classroom
- ✓ An opportunity to present a case study in a face-to-face setting with students working through the case in a collaborative manner
- ✓ As a method to help foster critical thinking that relates to the clinical setting

The newly developed course, MITS 423S Pathology for the Health Care Professional, offers all 53 modules to the practicing professional as an opportunity to review cases not commonly seen at outside institutions. As students work through the unique cases, interactivity and low stakes assessment are also part of the modules.

The authors have presented the modules at national educational conferences. Faculty and learner feedback has been very positive with comments highlighting strengths of the modules being the in-depth case studies, interactive ultrasound, computed tomography and magnetic resonance images, and quizzing features.

Student Quotes:

"The modules allowed me to visualize pathology of concern and to explore subject knowledge."

"The interactivity of the modules was optimal — very informative."

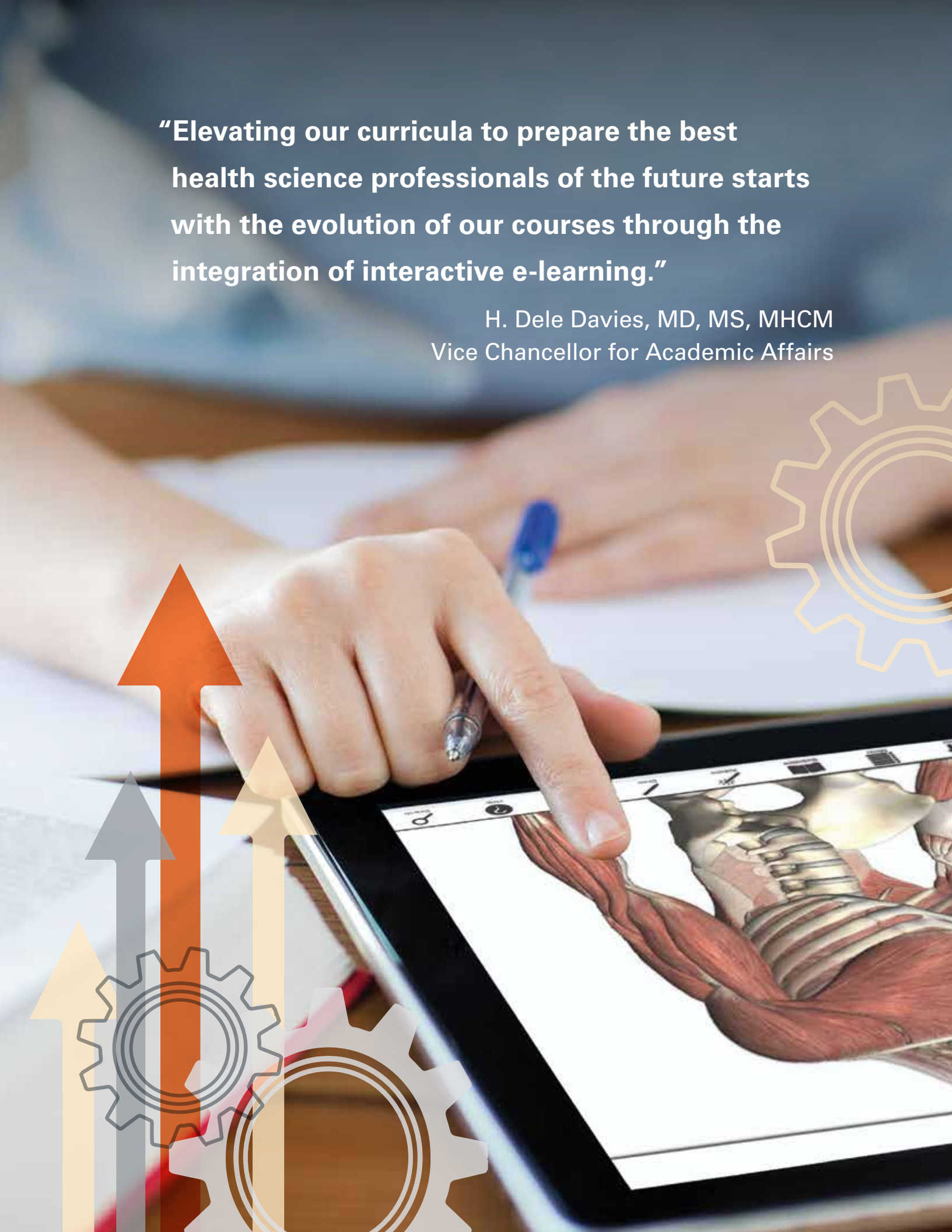
"The modules included multiple links to further my education on topics discussed and told a large amount of information about the specific case."

"The e-learning module did a really good job of: 1). Defining the prognosis and treatment of Page Kidney and 2). Using a case study that had lots of pictures and scans that helped to aid my learning."



“Elevating our curricula to prepare the best health science professionals of the future starts with the evolution of our courses through the integration of interactive e-learning.”

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



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