

# Medical Education in the New Millenium

innovative development, design & delivery  
of instructional resources relevant to the  
modern student

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# ABSTRACT

Modern medical education involves a rigorous process of accumulating, assimilating, and disseminating large amounts of medical knowledge in a manner that is useful and meaningful to future physicians. Millennial learners have uniquely different learning styles than previous generations. Today's students are digitally literate, experiential learners who expect educators to incorporate digital information technologies in the curriculum to enhance access to information and support learning. Effective educators must be familiar with new information technologies and understand how to use them appropriately for medical education without straying from fundamental principles of teaching. Technology should merely be used to increase convenience and collaboration in the learning process, functioning more as a medium for education and means to effectively transit information to the new generation of learners in the digital era. This project will investigate the quantitative and qualitative differences between traditional (pre-digital, didactic lecture) methods of teaching versus the incorporation of new technologies in the learning experience (didactic lecture + interactive digital modules) to determine if there is a subjective and statistically significant benefit to medical student learning outcomes. This work will discuss information technology challenges to educators: (a) understanding how technology shapes the learning preferences of students, (b) utilizing new technologies to develop innovative educational resources, (c) properly using learning technologies to enhance the medical curriculum, and (d) establishing valid and reliable criteria by which to evaluate the use of emerging educational technologies in medical education.

# BUDGET

**Software:** Adobe Creative Cloud (CC) is a subscription service from Adobe Systems that offers users access to a collection of software for graphic design, video editing, web development, photography, and Cloud services. All other software required to create, design, and publish the required study materials (lectures, e-learning modules, digital texts/media) has been previously purchased by a study affiliate (approximately \$3200). **\$420.**

**Training:** These online training & tutorial modules will have two primary purposes. The first is to train study affiliates in the use of software and information technology in several categories (content development, application design, graphic elements creation: 3D/animation, audio/video editing, & web and interactive design), to the point that they will be able to use these technologies to develop, edit, and mount the multimedia to be used within the study. The second purpose will be to serve as a resource in the creation of an online guide intended for future UTSW inter-departmental faculty use for the creation, development, and integration of their own educational interactive multimedia into pre-existing curriculum. Study collaborators will continue to expand this online guide to identify, compile, and disseminate print/electronic materials and related resources for use by UTSW faculty. **\$380.**

**Contracted Services:** A graphic designer will create original elements (digital medical illustrations, audio bytes, instructional video clips, interactive/animated graphics) to be used in the development of the interactive module used within the study. All graphics created for use in this study will be owned by the UTSW Department of Anesthesiology & Pain Management. A webmaster will be responsible for creating a platform from which to run the interactive learning module used within the study. Additionally, the webmaster will create and maintain the aforementioned online faculty guide. **\$4200.**

<b>Software</b>	
Adobe Creative Cloud Software Subscription (Annual)	\$420
<b>Training</b>	
Lynda: Software Training & Tutorials Subscription (Annual)	\$380
<b>Contracted Services</b>	
Graphic Designer	\$1200
Webmaster	\$3000
<b>TOTAL</b>	<b>\$5000</b>

# PROPOSAL

*"There is a way to do it better - find it." - Thomas Edison*

The practice of medicine is a learned art, built upon a solid framework of didactic learning, reading, observation, practice under guidance, and repetition. It is doubtful that this time-honored model will change, however, incorporating new methods of information delivery is quickly becoming necessary in educating the twenty-first century student.

The Information Age has affected nearly every facet of modern life; however, the education of healthcare professionals is largely based on the traditional, century-old apprenticeship model best described by the adage, "see one, do one, teach one." This traditional method of 'learning by doing,' however, is not without flaw.<sup>1</sup> It fails to provide knowledge acquisition in a structured fashion (a method proven to be the most effective for the adult learner) and more notably, teaching opportunities are dependent upon a random flow of patients/cases rather than an organized curriculum.<sup>2</sup> Furthermore, restrictions on work hours, post-call days off, and the growing distribution of training at multiple hospitals and geographic locations limit the time available to deliver extensive, engaging lessons. Consequently, student engagement with the education process is compromised. Often, passive, less effective, modes of learning (ex: reading) must solely supplement the medical curriculum. Herein, lies the great disparity between the engaged student and the passive learner that, as this study postulates, can effectively be bridged by the integration of interactive modules that enhance face-to-face education and supplement passive learning.

Greater access to personal computers, improved user capability, a growing number of useful applications, and more convenient, faster Internet access are important factors changing the nature of traditional teaching and learning.<sup>3</sup> However, change has largely occurred without adherence to an accepted standard or direction from professional societies. Although the use of digital and web-based learning modalities are commonly utilized, there are many questions about how these resources are best integrated into medical education, and if they do, indeed, enhance and improve the learning process.

This project will address the following issues: what is the role of advanced technology in presenting didactic content and is some content better presented by interactive multimedia than conventional media? Should digital educational resources be unique stand-alone course materials or should they

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<sup>1</sup>Brokaw, M., Spillane, LL., & Koval, E. (1999) 'Defining competency based learning objectives in resident education'. Acad Emerg Med 6, 483.

<sup>2</sup> Johnson, WL., Rickel, J., Stiles, R., & Munro, A. (1998) 'Integrating pedagogical agents into virtual environments'. Presence 7, 523-46.

<sup>3</sup> Chodorow, S. (1996) 'Educators must take the electronic revolution seriously'. Acad Med 71, 221-6.

supplement traditional course material? What is the role of the clinician-educator in producing electronic material? Most importantly, are teaching methods that incorporate the use of innovative, multi-modal educational resources more successful than traditional, didactic methods of teaching when comparing objective and subjective student outcomes?

The purpose of this project is to investigate the quantitative and qualitative differences between traditional (pre-digital, didactic) methods of teaching versus the incorporation of new technologies in the learning experience to determine if there are subjective benefits and statistically significant differences in medical student learning outcomes.

The goal of this project is to understand how technology can be exploited to enhance traditional methods of teaching in order to better educate future physicians. Additionally, recommendations on the following challenges facing educators today will be discussed: (a) understanding how technology shapes the learning preferences of students, (b) utilizing new technologies to develop innovative educational resources, (c) properly using learning technologies to enhance the medical curriculum, and (d) establishing valid and reliable criteria by which to evaluate the use of emerging educational technologies in medical education.

According to educational research over the past three decades, adults usually act as self-directed, internally-motivated, experienced students who learn best by interaction with material.<sup>4</sup> Focused upon practical applications, the adult learner gains insight as information is placed within a contextual framework.<sup>5</sup> In contrast, traditional medical training can be rigid and erratically structured, lecture-based, and focused on the rote memorization of fact, leaving little room for self-directed, interactive education.

Fourth-year medical students enrolled in the UT Southwestern Anesthesiology clerkship elective will be randomly assigned to participate in one of two separate learning modules. Module 1 will represent traditional teaching methods and will consist of a didactic lecture covering the difficult airway algorithm (DAA) as presented by the American Society of Anesthesiologists.<sup>6</sup> Module 2 will represent the integration of technology in traditional teaching methods and will consist of the same didactic lecture (Module 1) followed by a short, self-guided, interactive learning module designed to familiarize healthcare professionals with the DAA.

To assess the impact of different teaching methods on learning outcomes, students will complete a pre- and post-module assessment related to presented content. Average pre- and post-module scores will be calculated and used in a statistical paired difference test to determine if baseline

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<sup>4</sup> Knowles, MS (1984) *Andragogy in Action*. 1st ed. San Francisco: Jossey-Bass.

<sup>5</sup> Macala JC. Sponsored experiential programs—learning by doing in the workplace. In: Lewis LH, ed. *Experiential and Simulation Techniques for Teaching Adults*. Vol 30. San Francisco: Jossey-Bass; 1986:57–70.

<sup>6</sup> Lippincott Williams & Wilkins, (2013) 'Practice Guidelines for Management of the Difficult Airway: An Updated Report by the ASA Task Force on Management of the Difficult Airway'. *American Society of Anesthesiologists* 118, (2) 1-20.

knowledge significantly improved after each module ( $\alpha < 0.05$ ) within each study group. Additionally, Welch's t-test will be used to compare average post-module scores between the two study groups to determine if a statistically significant difference ( $p < 0.05$ ) exists between learning outcomes for either teaching method.<sup>7</sup> Lastly, a post-module survey will be conducted assessing subjective responses to either assigned module in accordance with Bloom's Taxonomy criteria - a classification of the different learning objectives educators set for students.<sup>8</sup> These studies will be repeated during each clerkship month for the academic year of 2014-2015.

The PI will serve as the primary project contact and will oversee the development of each learning module and take responsibility for conducting the study (administering pre- and post-assessments/surveys) as well as compiling and analyzing all data. The PI may delegate project tasks related to the aforementioned duties to study affiliates. Module content will be presented by James Griffin, MD of the UTSW Department of Anesthesiology & Pain Management. Data will be collected once per clerkship month and analyzed at the end of each month as well as the end of the project (May 2015).

This proposal invites the Southwestern Academy of Teachers to invest in the future of education at UT Southwestern. Integration of technology in the learning environment is already taking place within UTSW as well as the academic community at large. In spite of this fact, literature regarding *discussions* of educational technology far outnumber articles presenting actual research data on the topic. Project funding would provide a unique opportunity to further advance teaching methods at UTSW, both quantitatively (ex: improved board scores) and qualitatively, and provide useful recommendations for some of the challenges facing educators today when bringing technology into the classroom. Additionally, project funding will allow creation of an online guide that would feature a discussion blog, question & answer board, how-to guides/video tutorials for the creation and application of educational resources, and examples of 'technology-in-action' within the classroom. This last section would feature resources that are currently being used within medical classrooms around the country and would also highlight new projects being developed by UTSW faculty.

It has been said that if advances in the automotive industry had kept pace with the computer technology industry, cars today would cost \$2 and travel at the speed of sound on a thimbleful of gas. In order to remain a prestigious and relevant learning institution, UTSW cannot afford to similarly fall behind the technology curve and therefore must invest resources into today's education of tomorrow's healthcare leaders.

*"The best preparation for tomorrow is to do today's work superbly well." - William Osler, MD*

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<sup>7</sup> Sawilowsky, Shlomo S. (2002). 'Fermat, Schubert, Einstein, and Behrens-Fisher: The Probable Difference Between Two Means When  $\sigma_1 \neq \sigma_2$ .' Journal of Modern Applied Statistical Methods 1 (2): 461-72.

<sup>8</sup> Bloom, BS, Engelhart, MD, Furst, EJ, Hill, WH, Krathwohl, DR. (1956). Taxonomy of educational objectives: The classification of educational goals. Handbook I: Cognitive domain. New York: David McKay Company.