

Coupling Technology With Learning Theory in Curriculum Development: Postgraduate Medical Education at Mayo Clinic

Educating the next generation of physicians is becoming increasingly complex. Advancements in medical knowledge, coupled with an ever-changing health care delivery system, have magnified the challenges facing medical educators.¹ Unfortunately, medical education continues to be grounded more in “tradition, ritual, culture, and history, [rather] than [in] any easily expressed theoretical or conceptual framework.”² Ideally, medical curriculum should be able to adapt to these rapid changes in the learning environment while remaining grounded in the fundamental tenants of learning theory.

Engaging a medical trainee as an adult learner requires an appreciation of andragogy, defined as “the art and science of helping adults learn.”³ Andragogy was initially conceptualized by German educator Alexander Kapp, and Malcolm Knowles is credited with the introduction of andragogy to North America.⁴ Andragogy is based on 5 basic assumptions: first, adult learners are independent and self-directed; second, they have accumulated a wealth of experience to use as a resource; third, they integrate learning into the demands of daily ritual; fourth, they desire a problem solving–based approach; and fifth, they are driven by internal rather than external motivation.³ Similarly, medical trainees should be self-directed, internally motivated, and interested in real time problem solving while accumulating experience. The development of a medical curriculum should reflect the principles of andragogy, particularly self-directed learning with a problem-centered focus.

Using the fundamentals of andragogy in a medical setting, a medical curriculum must be versatile enough to deliver effective teaching to different learning styles. Unfortunately, medical education has traditionally centered on objectives and time frames but not learning styles.⁵ David Kolb, an American educational theorist studying cognitive development theory, conceptualized 4 basic types of learners who use different methods of knowledge acquisition and subsequent implementation to solve problems. These include *the diverger*, who

prefers concrete experience, *the assimilator*, who seeks relative observation, *the converger*, who uses abstract conceptualization, and *the accommodator*, who acquires knowledge through active experimentation.⁵ Indeed, each learner may encompass each of these learning styles to a different extent. Although the task of addressing the needs of varied learning styles and simultaneously adhering to the principles of andragogy may initially appear overwhelming, the advent of multimedia has made those objectives possible.

We created a dynamic, versatile, and comprehensive interactive cardiovascular diseases curriculum for residents by referencing the principles of andragogy, Kolb’s learning styles, and cognitive multimedia learning theory. We used iTunes U as the platform to deliver this curriculum through a mobile interface, including the iPad and iPhone. This interactive, mobile, and dynamic curriculum incorporates both the fundamental principles of teaching and learning as well as the benefits of mobile technology (provided as online supplemental material).

The rapid accumulation of medical knowledge coupled with the implementation of work hour limitations presents a challenge to medical education. However, we believe this challenge may serve as an opportunity to create a dynamic, comprehensive, and interactive curriculum based on established principles of learning theory. We have placed great emphasis on basing our curriculum on the fundamentals of adult learning and adult learning styles.

John P. Bois, MD

Fellow, Division of Cardiovascular Diseases, Mayo Clinic, Rochester

Thomas M. Waterbury, MD

Fellow, Division of Cardiovascular Diseases, Mayo Clinic, Rochester

Megha Prasad, MD

Fellow, Division of Cardiovascular Diseases, Mayo Clinic, Rochester

Kalie Y. Kebed, MD

Fellow, Division of Cardiovascular Diseases, University of Chicago

Tanya H. Tajouri, MD

Fellow, Division of Cardiovascular Diseases, Mayo Clinic, Rochester

Ammar M. Killu, MBBS

Fellow, Division of Cardiovascular Diseases, Mayo Clinic, Rochester

DOI: <http://dx.doi.org/10.4300/JGME-D-16-00023.1>

Kyle W. Klarich, MD

Professor, Division of Cardiovascular Diseases, Mayo Clinic, Rochester

Heidi M. Connolly, MD

Professor, Division of Cardiovascular Diseases, Mayo Clinic, Rochester

Rick A. Nishimura, MD

Professor of Medicine, Division of Cardiovascular Diseases, Mayo Clinic, Rochester

Amy S. Oxentenko, MD

Associate Professor of Medicine, Division of Gastroenterology and Hepatology, Mayo Clinic, Rochester

Naser M. Ammash, MD

Professor of Medicine, Division of Cardiovascular Diseases, Mayo Clinic, Rochester

Charanjit S. Rihal, MD

Professor of Medicine, Division of Cardiovascular Diseases, Mayo Clinic, Rochester

Jill J. Nagel, PAC

Nurse Practitioner/Physician Assistant, Division of Cardiovascular Diseases, Mayo Clinic, Rochester

Nandan S. Anavekar, MB, BCh

Associate Professor of Medicine, Division of Cardiovascular Diseases, Mayo Clinic, Rochester

References

1. Cooke M, Irby DM, O'Brien BC. *Educating Physicians: A Call for Reform of Medical School and Residency*. San Francisco, CA: Jossey-Bass; 2010.
2. Hodges BD, Kuper A. Theory and practice in the design and conduct of graduate medical education. *Acad Med*. 2012;87(1):25–33.
3. Kaufman DM. Applying educational theory in practice. *BMJ*. 2003;326(7382):213–216.
4. Knowles MS. *The Modern Practice of Adult Education: Andragogy Versus Pedagogy*. New York, NY: Association Press; 1970.
5. Leonard A, Harris I. Learning style in a primary care internal medicine residency program. *Arch Intern Med*. 1979;139(8):872–875.