Technology in Medical Education

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University of Utah
RMAOEM Annual Conference
February 2012
• Evolution of Information and Education

• Evolution of Medical Education

• Use of Technology in Medical Education
Educational Challenges

• Early Ages: Access

• Renaissance and Industrial Ages: Retrieval

• Digital Age: ?
Exponential Growth of Computing
Twentieth through twenty first century

Source: Ray Kurzweil on Wikimedia Commons
Problems of the Digital Age include

Assessing

Understanding
Medical Education, 1800’s
<table>
<thead>
<tr>
<th>Goals</th>
<th>Challenges</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standardization</td>
<td>Lack of standardization or rigor. Poorly prepared students &amp; irregular achievement.</td>
<td>Four-year college degree pre-requisite. Standardize 2+2 basic science and clinical years. Establish accreditation process.</td>
</tr>
<tr>
<td>Integration</td>
<td>Limited science in curriculum. No connection between practice &amp; science.</td>
<td>Integrate laboratory finding with clinical practice in University teaching hospitals.</td>
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<tr>
<td>Habits of Inquiry and</td>
<td>Excessive emphasis on memorization rather than experience. Faculty inclined towards tradition not science.</td>
<td>Train in scientific methods by scientifically oriented faculty.</td>
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<tr>
<td>Improvement</td>
<td></td>
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<tr>
<td>Professional Formation</td>
<td>Unqualified teachers and role-models.</td>
<td>Move medical education into University culture with scientifically based faculty.</td>
</tr>
</tbody>
</table>
Update on the Flexner Report, 2010

• Many instances of foundational knowledge poorly linked to experience
• Good teaching subverted by inappropriate assessment
• Missed opportunities for students to participate in non-clinical physician roles
# Recommendations for Educating Physicians, 2010

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<td>Standardization and individualization</td>
<td>Medical Education not outcome based, inflexible, too long, not learner-centered</td>
<td>Standardize learning outcomes through assessment of competencies. Individualize the learning process. Elective programs to develop skills for inquiry and improvement.</td>
</tr>
<tr>
<td>Integration</td>
<td>Poor connection between formal knowledge and experiential learning. Fragmented understanding of patient experience. Inadequate understanding of civic and non-clinical roles. Poor team delivery skills.</td>
<td>Early clinical immersion &amp; opportunity for advanced learners to reflect and study. Integrate basic, clinical, and social sciences. Engage in a more comprehensive perspective on patients’ experiences of illness and care with more longitudinal patient connections. Experience broader roles of physicians. Incorporate interprofessional education and teamwork in the curriculum.</td>
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# Recommendations for Educating Physicians, 2010

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<td>Habits of inquiry and improvement</td>
<td>Lack of focus on long-term knowledge building and enduring commitment to excellence. Inadequate participation in inquiry, patient population management, health promotion &amp; improvement.</td>
<td>Engage learners in inquiry, innovation, and improvement of care. Focus on population health, quality improvement, and patient safety. Include quality education sites outside the University teaching hospitals.</td>
</tr>
<tr>
<td>Professional formation</td>
<td>Lack of clarity and focus on professional values. Inadequate expectations for progressively higher levels of professional commitment. Erosion of professional values due to pace and commercial nature of health care.</td>
<td>Formal ethics instruction. Address the hidden curriculum and align the espoused and enacted values of the clinical environment. Give feedback &amp; opportunities for reflection in context of a longitudinal mentoring relationship.</td>
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</table>
Technology

• Has contributed to the current challenges in medical education
  – Overwhelming amounts of information
  – Inconsistent quality of information
  – Increasing integration into clinical practice leading to more specialization

• Will be part of the solution
In this Guide, I first present an overview of Integrated Course Design and then work through each of the major phases, one at a time.

An Overview of Integrated Course Design

The basic components in this model of Integrated Course Design are the same as those found in other models of instructional design: analyze the situational factors, formulate the learning goals, design the feedback and assessment procedures, and select the teaching/learning activities. What is distinctive about this model is that these components have been put together in a way that reveals and emphasizes their interrelatedness. (See Model 1 below)

Model 1

The Key Components Of INTEGRATED COURSE DESIGN

- Learning Goals
- Teaching and Learning Activities
- Feedback & Assessment

Situational Factors

Curriculum Design

Creating Significant Learning Experiences, 2003
<table>
<thead>
<tr>
<th>Learning Objective</th>
<th>How Learning will be Assessed</th>
<th>Teaching/Learning Activity</th>
<th>Technology Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>What do students need to know or be able to do at the end of the course and/or in five years.</td>
<td>How will you know that a student met the learning objective?</td>
<td>How will the student acquire the knowledge, skill, understanding required for the Objective?</td>
<td>What tool will best facilitate the teaching, learning, and/or assessment, if any?</td>
</tr>
</tbody>
</table>

*Creating Significant Learning Experiences*, 2003
Zeigenfuss, D
Does online learning work?

Evaluation of Evidence-Based Practices in Online Learning
A Meta-Analysis and Review of Online Learning Studies
Does online learning work?

• “Students in online conditions performed modestly better, on average, than those learning the same material through traditional face-to-face instruction.”

• “Instruction combining online and face-to-face elements had a larger advantage relative to purely face-to-face instruction than did purely online instruction.”
What works online?

• Active engagement better than passive
• Instructor presence and feedback are critical
• Little difference in efficacy of particular online tools/approaches
Physician Online Education

• No evidence that online education is more or less effective than “traditional” education

• Online education provides tools and opportunities not available in face-to-face settings, such as
  – Ubiquitous access to resources
  – Asynchronous or synchronous interactions
  – Repetition
  – Scalable to many users

Triola MM et al. Medical Teacher, 24: e15-e20, 2012
Instructional Methods in Published Reports of Web-based Learning

• *Online lecture or tutorial (most common)
• *Online discussion
• Spacing of learning
• Practice exercises
• Patient cases

Cook D et al. Medical Education, 44: 765-774, 2010
Instructional Methods in Published Reports of Web-based Learning

- Self-assessment
- Feedback
- Homework
- *Simulation/Virtual experiences
- *Adaptation

Cook D et al. Medical Education, 44: 765-774, 2010
Online Lecture, Demonstration, Tutorial
Hi [Name],

I gave very similar numbers as you, except for intention to treat----gave them a .5 instead of a 1.0; as they didn't go into any specifics as to how they incorporated these numbers. I thought they might have some bias involved; as since no-one was blinded, who responded from both the treatment groups and the control groups might have influenced by reporting bias. On reviewing yours and the other students comments; I should have given these authors a Zero for co-intervention.....as they didn't do this at all for either group (although they did discuss it). Treatment allocation was stated to be random but without any details; so also in doubt.

Thank you.

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Subject: Re: [Name] article
Author: [Name]
Date: January 27, 2011 4:16 PM

Hello [Name],

It looks like we scored this the same on 7 of the 11 main subcategories. The four we differed on account for the difference in our overall rating. For the randomization, I scored it as a 0.5 instead of a 1.0. I agreed that they clearly attempted to randomize the groups but that they were only partially successful at best in doing so as the groups were not comparable. Regarding the treatment allocation being concealed, I scored this a 0.0 as I did not see where they described how the treatment was concealed to the provider or assessor. They only said that the investigator did not have contact with the patients but no mention of concealment nor the methods of concealment for the investigators was addressed. The authors even mentioned that the patients were aware of which groups they were in which means that the treatment allocation may not have been concealed to the patient either. The baseline comparability was another area we differed by 0.5. I felt that there were 3 or 4 significant baseline characteristics that were different that could have skewed the study results and that led to my score of a 0.0. The final area where we differed by 0.5 again was with compliance. I scored it a 0.5 based on what you said. I just felt they should have addressed more of the issue of compliance regarding the subcategories with data, especially since the data they did provide with those referred for cataract surgery for example was much less than 20%.

Overall, we didn't have any major differences in scoring such as 1.0 instead of a 0.0 and vice versa, and we did agree on 7 of the main categories as well as the non-scored category of lack of bias.

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Subject: Re: [Name] article
Author: [Name]
Date: January 29, 2011 3:27 PM

Thanks for your input [Name]. Seems that treatment allocation is one of the talking points for this study. I wish they had been more explicit in describing or stating how the allocation was concealed.

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Online Discussion
Screenshot of a Medical Simulation in Second Life


Emerging Tools and Trends

• Near term (next 12 months)
  – *Electronic books
  – *Mobile learning
• Second adoption horizon (next 2-3 years)
  – *Augmented reality
  – *Game-based learning
• Far-term horizon (next 4-5 years)
  – Gesture-based computing
  – Learning analytics

The 2011 Horizon Report
IMED ED

With our IMED initiative, UC Irvine’s School of Medicine is reinventing the traditional medical school curriculum for the 21st century, becoming one of the first in the nation to build a completely digital, interactive learning environment for the entering class of 2014. The initiative is designed to foster highly individualized and small-group learning for a richer medical school experience.

LATEST NEWS

18 OCT

Medical students share how they use the iPad as a learning tool and how it has changed the way they study medicine - during a webinar.

26 SEPT

“iPads in Medical School, the Student Perspective” webcast on Tuesday, October 18th at 10 a.m. PDT presented by the medical students at UC Irvine

29 AUG

Can digital textbooks truly replace the print kind?
Augmented Reality

Games

A disaster preparedness scenario game.

www.stopdisastersgame.org

Achievement Badges from the Khan Academy

www.khanacademy.org
Social Media
Social Media

• aka Web 2.0

• Various platforms that allow users to interact and generate content

• Examples: Blogs, Twitter, Facebook, Second Life, Wikipedia, comment boards in online newspapers . . .
Social Media

• Incredibly efficient means of disseminating information
• Builds community
• Flattens the hierarchy of who can create information
• Potentially associated with lost privacy
• Potential professional and ethical challenges for physicians
Social Media Concerns

• Violate patient privacy
• Establish inappropriate relationships with patients
• Harm the public image of physician professionalism
• Unprofessional, profane, or illegal content may compromise a student or physician’s future opportunities
AMA Statement on Professionalism in the Use of Social Media

- Refrain from posting patient information
- Use privacy settings and assume content is likely online permanently
- Maintain appropriate boundaries of the patient-physician relationship
- Consider separating personal and professional content online
- Address inappropriate content from a colleague first with the colleague and then with authorities, if not resolved
- Recognize that online actions can negatively impact reputation and career, and undermine public trust
Experiences, so far, using technology for OM resident education at the University of Utah
My Hybrid Courses

• Clinical and Behavioral Aspects of Preventive Medicine

• Advanced Topics in Occupational and Environmental Health
  – 2-year rotating curriculum with five themes
    • Professional Conduct
    • Medical Screening & Surveillance
    • Legalistic Aspects of OM Practice
    • Disaster Preparedness and Response
    • Clinical Occupational Medicine
Making the courses Hybrid & Online

• Good curriculum design
• Organization
• Orientation
• Learning the technology
• Prepare course materials far in advance
• Establish assessment rubrics
• Consistent instructor presence in the course – announcements, discussions, etc.
Course Changes

• Methodical about breaking large assignments into intermediate chunks
• Heavy use of Discussion boards for discussions and assignment submissions with peer input
• Lots of Peer Review
• More emphasis on demonstrating ability to produce a product or complete a task
• Posting of streaming video from lectures – now able to use a “flipped” approach to class with in-person sessions devoted to discussion and problem solving
Student Response

• Impressive level of online discussion
• Many appreciate the online convenience and use of multiple media types
• Some frustration with the Learning Management System and use of the technology
• Some strong opposition to the online format and educational approach. “I just want you to tell me what I need to know.”
Moving a program . . .

- Very hard to change teaching habits and beliefs
- Very hard to motivate older generation to adopt technology
- Very hard to appreciate the potential of technology without having experienced it
- Hours and cost of revising curriculums and developing online tools/resources are huge
Moving a program . . .

- Developing a Hybrid or Online program can take years
- Need common/standardized approach for student consistency
- Need lots of motivation and patience
Recommendations

• Use technology to support learning
• Focus on the fundamentals
• Allocate a variety of resources
  – Instructional design specialists
• Support and recognize faculty as they adopt new technologies
• Foster collaboration

• Cooke M, Irby D, Obrien B. Educating Physicians: A Call for Reform of Medical School and Residency. Jossey-Bass; 2010
Resources

• Fink, L. *Creating Significant Learning Experiences: an integrated approach to designing college courses.* San Francisco: Jossey-Bass; 2003
• Khan Academy: www.khanacademy.org
• Robin BR et al. *Preparing for the Changing Role of Instructional Technologies in Medical Education.* Academic Medicine, vol. 86, no. 4, 2011
Acknowledgements

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• Acknowledgement to the University of Utah Medical Scholars Program
Some Options for Additional Information

• University of Utah Technology Assisted Curriculum Center “Best Practices” - A Framework for Quality Online and Hybrid Courses: www.tacc.utah.edu/instructor_resources/bestpractices

• Educause: www.educause.edu
  – A non-profit organization promoting “the intelligent use of information technology”

• MindShift: http://mindshift.kqed.org/
  – Blog focusing on educational best practices, future trends, and technologies