LEARNING MEDICAL EDUCATION SYSTEMS IN 2043: LESSONS FROM PAST 25 YEARS

University of Michigan
Department of Learning Health Sciences
March Collaboratory

David H. Roberts, MD
Dean for External Education
Associate Professor of Medicine
Harvard Medical School
DISCLOSURES & CONFLICTS

I have no conflicts, financial or otherwise, to disclose
GOALS FOR TODAY

• Look back from 2043 to understand opportunities and challenges of a fully functioning learning medical education system

• Identify nascent learning medical education system building blocks

• Think creatively together how to expand and evolve these concepts in medical education
MEDICAL EDUCATION IN 2043: PATH TO SUCCESS

Picture of futuristic city
DOCTORS IN 2043: PRODUCT OF CAREFUL DEVELOPMENTAL PROCESS

Pictures of futuristic doctors
CAREFULLY SELECTED LEARNERS ENTER ADAPTIVE, INDIVIDUALIZED CURRICULUM

http://www.dreambox.com/adaptive-learning
PRECISION EDUCATION RELIES ON NETWORK DATA

- Faculty evaluations
- Patient reports
- Sensor data
- Peer feedback
- Staff 360 reviews
- Self assessments
- Regulatory agencies
- Classroom assessments
BUILT ON SUCCESS OF THE LEARNING HEALTH SYSTEM CORE MODEL

Friedman, 2014
APPLYING THE CONCEPTS MORE BROADLY

Learning X System

- Philosophy
- Methods
- Literature
CONTINUOUS IMPROVEMENT IN K-12 EDUCATION

2014 AERA Distinguished Lecture
Accelerating How We Learn to Improve

Anthony S. Bryk ¹

A chasm is growing between our rapidly rising aspirations for our educational systems and what schools can routinely accomplish. Education needs an improvement paradigm—one that recognizes the complexity of the work of education and the wide variability in outcomes that our systems currently produce. This article sketches out such a paradigm. It joins

Bryk 2015
K-12 INNOVATION TAKES TOO LONG!

Last Decade: Evidence-based Practice Movement

An academic has an idea → He/she designs and fine tunes an intervention → An RCT field trial (5 years later) → Evidence it can work

Reviewed by What Works Clearing House
Goes on an “approved list”

Districts required or “incented” to buy only from approved list → Educators “Implement with Fidelity”
MEDICAL EDUCATION WAS RIPE FOR REDESIGN

Guilds do not enhance innovation

Needed to move beyond, “See 1, Do 1, Teach 1”
LIMITATIONS OF THE “OLD” EDUCATION SYSTEM

Cooke 2013
CORE SYSTEM COMPONENTS IN 2043

• Integrated network of learners, teachers, patients, classrooms and clinical venues

• At the core, data, data, data, data…

Picture of futuristic classroom
HISTORICALLY SPEAKING, WHAT WERE THE BUILDING BLOCKS?

• Classroom architecture changed to overcome limitations of
  – Distance
  – Time
  – Schedule
  – Interactivity

Pictures of HBX Live studio
https://hbx.hbs.edu/learning-platforms/hbx-live
DATA TO DETERMINE LEARNING, LISTENING, ENGAGEMENT, AND MORE

Professor Rosalind Picard
MIT Media Lab
Affective Computing Research Group

https://www.fastcodesign.com/90160775/this-mit-startup-is-developing-a-fitness-tracker-for-your-brain
PRIOR INNOVATIONS IN MEDICAL EDUCATION

• Improve medical education globally
• Create the best online experience for key foundational areas of medicine and health
• Design and build to maximize learning and learner engagement
• Leverage unique advantages of online learning
• Utilize data for rapid-cycle change
• Transfer learning to on campus teaching
VIDEO VIEWING PATTERNS

Picture of HMX viewing patterns

*Immunology “Sentinel Cells” video

• Hot spots indicate areas of re-watch
• Correlate with other data to determine significance and feed back to improve the learning value
WHAT DO LEARNERS WANT AND NEED TODAY?

• Mobile
• Social
• On demand
• Global
• Modular
• Adaptive
• Blended
• Scalable
• Learning science-based
WHAT DO WE MEAN BY LEARNING SCIENCES?

• Learning is deeper and more durable when it costs effort
• Retrieval practice is more effective than review
• Problem solving before being taught solutions leads to better learning
• New material put into context enhances retention
• Interleaved concepts provide synergy
• Spacing of repetition or practice is key
OUR TEACHERS RELY ON PROFESSIONAL DEVELOPMENT

To improve teaching
To become educators in addition to being teachers
To develop an accepted set of “core skills” as a medical educator
To advance careers within academic medicine
To increase satisfaction (“renewal”)
DO WE THINK ABOUT OUR TEACHING?

LADDER OF COMPETENCE

Unconscious incompetence
Ignorance, misplaced confidence

Conscious incompetence
Aware of limitations

Conscious competence
Growing confidence and skills

Unconscious competence
‘Autopilot’, risk of complacency

Mindful competence
Fully present, sensitive to context and opportunity

Modified from Burch 1970
RECOGNIZE WHAT TEACHERS NEED TO SUCCEED

Picture of futuristic individuals rating each other

- NET EDUCATION PROMOTER SCORES
- LEARNING LIKELIHOOD SCORES
- PEER RATINGS OF TEACHING
PROFESSIONAL SKILLS AND ATTRIBUTES OF THE SUCCESSFUL MEDICAL EDUCATOR

• Facilitates active learning
• Leverages principles of adult learning
• Uses needs assessments to design curricula
• Leads interactive small and large group discussions
• Provides effective feedback
• Experiments with innovative pedagogy
• Identifies opportunities to use education technology
• Develops appropriately challenging assessments
• Invests in ongoing professional development as an educator
• Participates in a community of medical educators
• Contributes to the medical education literature
PEER OBSERVATION CAN IMPROVE TEACHING

"I have been an attending physician for 10 years. Your observations and feedback were the first truly useful insights into my own teaching I have ever received”

Direct quote from HMS colleague
OUR LEARNERS TRANSFER KNOWLEDGE INTO ACTIVE SITUATIONS

- Virtual hospital training
- Simulated encounters
- Quantified learner physiology

Picture of virtual reality avatars
WHAT OUR CLASSROOMS ENCOURAGE

• **Activation of prior knowledge** facilitates subsequent processing of new information

• **Elaboration of knowledge** at the time of learning (e.g., discussion, answering questions) enhances subsequent retrieval

• **Transfer**: “….concept or principle learned in one context can be transferred or applied to a problem…different in initial appearance…requires the same principles for solution.”
Iterative approach, built on initial pilot
Influenced classroom dynamics and physical set up
Impacts on faculty development and innovation
WARD-BASED TEACHING HAS CHANGED... A LITTLE

Pictures of ward teaching and futuristic robo doc
PATIENT ADMISSION VIDEOS

- In a post-text world, video rules
- Peer-peer and faculty-peer feedback
- Uploaded directly to EHR and patient’s medical portal

Picture of doctor taking selfie
Welcome to the Post-Text Future - The New York Times
LEARNERS MONITORED AND TAGGED WITH RF ID

Pictures of sensors and medical RF ID tag data
Identification of which papers to read

Research tagged and linked to patient encounters for just-in-time learning

Continuing education needs driven by analysis of clinical care
INITIAL ALGORITHMIC ANALYSES OF LITERATURE VALUE – GOING BEYOND IMPACT FACTOR

Human neural stem cell grafts in rhesus monkeys improve motor function after spinal cord injury [PreClinical]

Corinne Foley - March 19, 2018

Hemodynamic markers of pulmonary hypertension in heart failure with preserved ejection fraction are associated with mortality

Ticagrelor and clopidogrel have similar major bleeding rates following thrombolytic therapy

Administrative costs, provider salaries, and pharmaceutical prices drive higher healthcare spending in the United States
MEDICAL EDUCATION IN THE UBIQUITOUS INFORMATION ERA – WHAT TO DO?


• Create productive learning environments with rich data capture opportunities
• Leverage all data from learners and teachers
• Prepare, pilot, practice, iterate
• Eliminate waste (lost opportunity) in teaching
• Maintain systematic skepticism for what actually works
• Advance the field through research

HOW DID WE ACHIEVE SUCCESS BY 2043?

Picture of checklist