The *Genes to Society* Curriculum Reform at Johns Hopkins University School of Medicine

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Associate Dean for Curriculum
Learning Objectives

• Review the external and internal drivers for change at one medical school.
• Use Kotter’s* model of institutional change to analyze successful curriculum reform efforts.
• Anticipate potential pitfalls and learn tips for addressing barriers to comprehensive curriculum reform.

*John Kotter, _Leading Change_, 1996
Johns Hopkins School of Medicine
1893

- First medical school to require a college degree
- Required reading knowledge of French/German
- Students were seen as recipients of knowledge and faculty partners in developing new knowledge
- 2 years preclinical + 2 years clinical
1992 Curriculum Reform
“Curriculum for the 21st Century”

• Year 1: Normal
  – Molecules & Cells, Anatomy, Epidemiology, Neuroscience/Psychiatry, Organ Systems
• Year 2: Abnormal
  – Pathology, Pharmacology, Pathophysiology, Clinical Skills
• Years 3-4: Departmental Clinical Clerkships
  – Require 9 basic clerkships, 0 advanced clerkships
  – Students may take clerkships in any order and at any time
  – Clinical years start in April of Year 2
• Years 1-4: Physician and Society
  – Stand alone course focusing on professionalism, humanism
Eight Steps to Transforming Your Organization*

1) Establish a Sense of Urgency
2) Form a Powerful Guiding Coalition
3) Create a Vision
4) Communicate the Vision
5) Empower Others to Act on the Vision
6) Plan for and Create Short-term Wins
7) Consolidate Improvements and Produce Still More Change
8) Institutionalize New Approaches

*John Kotter, Leading Change, 1996
1) Establish a Sense of Urgency

- SWOT analysis
- Examine competition
- Identify crisis (or create one)

*John Kotter, Leading Change, 1996*
A New Curriculum: Why Now?

• **External Drivers**
  – Explosion of new knowledge since 1991
  – Societal concerns: disparities, outcomes, safety
  – Changing hospital and patient demographics
  – Multidisciplinary topics: safety, aging, pain, nutrition, ethics,
  – Communication, professionalism, health policy
  – Research training, community service, community relations
  – New technologies of learning and care
  – LCME self-study: primary care, coordination, student life, oversight and organization, outcomes
3) Creating a Vision

• Develop a vision of the future that is easy to communicate to all stakeholders

*John Kotter, Leading Change, 1996
“Diseases are caused by the independent action of neither genes nor experiences, but by the influence of each on the protein products that are unit steps of the homeostasis of specific individuals in whom they coincide for reasons traceable to phylogeny and culture.”
THE SEQUENCE EXPLOSION

At the time of the announcement of the first drafts of the human genome in 2000, there were 6 billion base pairs of sequence in the three main databases for ‘finished’ sequence: GenBank, run by the US National Center for Biotechnology Information; the DNA Databank of Japan, and the European Molecular Biology Laboratory (EMBL)/Nucleotide Sequence Database. The databases share their data regularly as part of the International Nucleotide Sequence Database Collaboration (INSDC). In the subsequent first post-genome decade, they have added another 270 billion bases to the collection of finished sequence, doubling the size of the database every year. In that same period, the number of base pairs in the human genome has been created and stored by researchers around the world in the Trace archive and Sequence Read Archive (SRA).

DNA SEQUENCES BY TAXONOMY

International Nucleotide Sequence Database Collaboration: The main repositories of finished sequence span a wide range of organisms, representing the many priorities of scientists worldwide.

HOW MANY HUMAN GENOMES?
The graphic shows all published, fully sequenced human genomes since 2003. Including one from the first quarter of 2010. Some are resequencing efforts with the same person and the list does not include unpublished completed genomes.
Clinical Assessment Incorporating a Personal Genome
Ashley EA, Butte AJ, Wheeler MT.
Lancet 2010;375:1525

“We aimed to (analyze) a complete human genome in a clinical context.”
“Although challenges remain, our results suggest that whole-genome sequencing can yield useful and clinically relevant information for an individual patient.”

Ashley EA, Butte AJ, Wheeler MT. Lancet 2010;375:1525
The Genes to Society Paradigm

Previous Curriculum
Molecular Biology
Physiology
Pharmacology
Pathology
Etc.

New Systems Biology
For each organ system:

Society
Community-Family
Environment
Risk
Patient phenotype
Organ physiology
Cell biology
Genomics
Organ Failure
GTS Principles

1. Phenotype is determined by internal and external factors.
2. Dichotomy between normal and abnormal is artificial.
Genes To Society Curriculum

• Vertical Strands: Courses
  – Scientific Foundations
  – Clinical Foundations
  – Genes to Society Course (organ system based)

• Horizontal Strands
  – Broad topics integrated into curriculum throughout 4 years with increasing complexity and sophistication
## Horizontal Strands

<table>
<thead>
<tr>
<th>Biomedical</th>
<th>Social and Behavioral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anatomy</td>
<td>Human Development</td>
</tr>
<tr>
<td>Embryology</td>
<td>Aging</td>
</tr>
<tr>
<td>Cell Physiology</td>
<td>Pain Care</td>
</tr>
<tr>
<td>Genomics/Proteomics</td>
<td>Patient Safety</td>
</tr>
<tr>
<td>Imaging</td>
<td>Ethics &amp; Professionalism</td>
</tr>
<tr>
<td>Informatics</td>
<td>Epidemiology</td>
</tr>
<tr>
<td>Molecular Biology</td>
<td>Nutrition</td>
</tr>
<tr>
<td>Pathology</td>
<td>Communication</td>
</tr>
<tr>
<td>Pharmacology</td>
<td>Cultural Competence</td>
</tr>
<tr>
<td>Physiology</td>
<td>Health Policy</td>
</tr>
</tbody>
</table>
2) Forming a Powerful Guiding Coalition

Gerald Hart, PhD
Director, Dept. Biochemistry

Charles Wiener, MD
Director, Year 2

David Valle, MD, PhD
Director, McKusick-Nathans Institute of Genetic Medicine
Major Discussions

- “Why Change?”
- Time aka Turf
- Lecture: Active Learning
- “You are reducing the rigor of the Hopkins curriculum”
- Flexibility of the Clinical Curriculum
5) Empowering Others to Act on the Vision

• Get rid of obstacles to change
• Change systems or structures that seriously undermine the vision
• Encourage risk taking and nontraditional ideas, activities and actions.

*John Kotter, Leading Change, 1996
Get rid of obstacles to change

- Problem: Faculty were not incentivized to change because teaching was undervalued at Hopkins.
- 2003: White Paper: Advancement of Teaching in the School of Medicine
- 2005: Committee on Criteria for Promotion and Tenure
- 2007: Committee on Valuing Teaching Effort
- 2009: Institute for Excellence in Education
Budget Decisions

1) New content vs. Old content
2) Length of a section
3) Dedicated course coordinator or OOC coordinator
4) Paper syllabus
5) Dean’s .10 FTE rule
Infrastructure Decisions

- Learning Management System
- Curriculum management software
- Portfolio software
- Online testing software
- Student outcomes database
- Simulation center software
- Virtual patient software

- Blackboard
- OASIS
- E-value MyFolio
- Questionmark
- (Internal)
- B-line
- (TBD)
5) Empower Others to Act on the Vision

Clinical Skills Committee

- Standardized & Simulated Patient
  - Clinical Foundations
- Ambulatory Patient
  - Longitudinal Clerkship
  - Transitions to the Wards
- Hospitalized Patient
  - Core Clinical Clerkships
  - Required Advanced Clerkships
- Critical & Complex Patient
  - Transition to Internship
- Rapid Response, ACLS
- Advanced Communications

Competency Development
<table>
<thead>
<tr>
<th>Month</th>
<th>Week</th>
<th>Course/Block</th>
</tr>
</thead>
<tbody>
<tr>
<td>August</td>
<td></td>
<td><strong>IS Health Disp</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Scientific Foundations of Medicine</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>IS Prevention</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>IS Global</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Long. Clerk.</strong></td>
</tr>
<tr>
<td>March</td>
<td></td>
<td><strong>Genes to Society</strong></td>
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<tr>
<td></td>
<td></td>
<td><strong>IS Pain</strong></td>
</tr>
<tr>
<td>June</td>
<td></td>
<td><strong>Summer Break (9 weeks)</strong></td>
</tr>
<tr>
<td>August</td>
<td></td>
<td><strong>IS Sub Abuse</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Genes to Society</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>IS Pt Safety</strong></td>
</tr>
<tr>
<td>March</td>
<td></td>
<td><strong>Transition to Wards</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Break</strong></td>
</tr>
<tr>
<td>June</td>
<td></td>
<td><strong>Break</strong></td>
</tr>
<tr>
<td>September</td>
<td></td>
<td><strong>Pulm (13) Renal (17)</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Long. Clerk.</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>SC</strong></td>
</tr>
<tr>
<td>September</td>
<td></td>
<td><strong>Genes to Society</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>IS Pt Safety</strong></td>
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<tr>
<td>March</td>
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<tr>
<td></td>
<td></td>
<td><strong>Break</strong></td>
</tr>
<tr>
<td>June</td>
<td></td>
<td><strong>Break</strong></td>
</tr>
<tr>
<td>September</td>
<td></td>
<td><strong>Med, Surg, Peds, GYN-OB</strong></td>
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<tr>
<td></td>
<td></td>
<td><strong>Break</strong></td>
</tr>
<tr>
<td>September</td>
<td></td>
<td><strong>Surg, Peds, GYN-OB</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Break</strong></td>
</tr>
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<td>September</td>
<td></td>
<td><strong>Surg, Peds, GYN-OB</strong></td>
</tr>
<tr>
<td>March</td>
<td></td>
<td><strong>Break</strong></td>
</tr>
<tr>
<td>April</td>
<td></td>
<td><strong>TRIPLE 1</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TRIPLE 2</strong></td>
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<tr>
<td></td>
<td></td>
<td><strong>Advanced Clerkship</strong></td>
</tr>
</tbody>
</table>

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*All core blocks must be completed by October of year 4.*
# Topics in Interdisciplinary Medicine Courses

<table>
<thead>
<tr>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health Care Disparities &amp; Service Learning</td>
</tr>
<tr>
<td>Prevention &amp; Health Promotion</td>
</tr>
<tr>
<td>Global Health</td>
</tr>
<tr>
<td>Pain Care</td>
</tr>
<tr>
<td>Disaster Medicine</td>
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<tr>
<td>Substance Abuse Care</td>
</tr>
<tr>
<td>Patient Safety &amp; Quality</td>
</tr>
<tr>
<td>End of Life &amp; Palliative Care</td>
</tr>
</tbody>
</table>
Health Care Disparities & Service Learning Course
6) Planning for and Create Short-Term Wins*

- Renewal efforts can lose momentum if there are no short-term wins to meet and celebrate.*
- Plan for pilots with volunteers (they are your most enthusiastic students).
- Recognize and reward your change agents.
- Retreats = Celebrations

Transitions to the Ward
Patient Safety for Medical Students
## Short-term Outcomes

<table>
<thead>
<tr>
<th>Class</th>
<th>NBME CBSE Score</th>
<th>SD</th>
<th>Low Score</th>
<th>High Score</th>
<th>Step 1 Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>61.9</td>
<td>7.9</td>
<td>45</td>
<td>84</td>
<td>--</td>
</tr>
<tr>
<td>2013</td>
<td>61.4</td>
<td>8.4</td>
<td>42</td>
<td>93</td>
<td>239</td>
</tr>
<tr>
<td>2012</td>
<td>63.1</td>
<td>6.7</td>
<td>44</td>
<td>80</td>
<td>235</td>
</tr>
</tbody>
</table>
7) Consolidate Improvements and Produce More Change

• Use increased credibility to change systems, structures and policies that don’t fit the vision.
• Reinvigorate the process with new projects, themes and change agents.

*John Kotter, Leading Change, 1996
What are we doing to improve lifelong learning?

• New curriculum mandate: less than 40% lecture time.
• Formal attendance policy. Lecture attendance is not required.
• E-Lectures: 20-30 minute online lectures; start the day later to allow online review.
Lecture Behavior Survey of Students

- March 2010
- Optional question in end of course examination, asked students to report their lecture attendance in Year 1 and Year 2.
- Compared with NBME Basic Science Comprehensive administered the same month.
- IRB Approval
## Self-Report of Lecture attendance

95 (79% of class) MS 2 students responding

<table>
<thead>
<tr>
<th>% of Lectures attended</th>
<th>Year 1</th>
<th>Year 2</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 80%</td>
<td>46</td>
<td>44</td>
<td>46%</td>
</tr>
<tr>
<td>20% or fewer</td>
<td>7</td>
<td>10</td>
<td>10%</td>
</tr>
</tbody>
</table>
# Self-Report of Lecture Attendance Change from Year 1 to Year 2

<table>
<thead>
<tr>
<th>Attendance Pattern</th>
<th>Frequency</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>No change</td>
<td>57</td>
<td>60%</td>
</tr>
<tr>
<td>Increased attendance from Y1 to Y2</td>
<td>14</td>
<td>15%</td>
</tr>
<tr>
<td>Decreased attendance from Y1 to Y2</td>
<td>24</td>
<td>25%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>95</strong></td>
<td></td>
</tr>
</tbody>
</table>
CBSE Performance

• Year 1 exam performance was highly correlated ($r=0.65$) with CBSE performance.
• Year 1 Exam scores significantly predicted CBSE scores, $F(1,116)=83.70$, $p<.001$.
• Self-reported lecture attendance for both Year 1 and Year 2 was NOT correlated with CBSE performance.
• Many limitations!
MIT Technology Enabled Active Learning
How do we know that students are integrating GTS Paradigm?
8) Institutionalizing New Approaches

• Articulate the connections between the new (curriculum) and (institutional) success.

• Develop the means to ensure leadership development and succession.

College Advisory Program
Other outgrowths of curriculum reform:

- Associate Dean for Curriculum & Office of Curriculum
- College Advisory Program (2005)
  - 4-year mentors for academic advising
  - Professionalism curriculum
- New Promotion Criteria for Educators (2005)
- Armstrong Medical Education Building (2009)
- Institute for Excellence in Education (2010)
- New faculty collaborations
- Educational Scholarship
What Didn’t We Anticipate?

• Graduate Students
• Clinical Departmental Resistance
• Technology
• Accountability
• Workload
What did it take to achieve a comprehensive curriculum reform?

I. Leadership function*
   - Political will
   - Advocacy & Marketing
   - National goals and values
   - Core concept (principle)

What happened at JHU:
   - Charge from the Dean
   - Multiple meetings: departments, ABMF, BOT
   - Communications
   - IOM Reports
   - Systems based biology

• Accessed at: www.ibe.unesco.org/Curriculum/Rpack/capacitybuilding.htm
What did it take to achieve a comprehensive curriculum reform?

II. Management Function*
- Structures for undertaking work
- Processes of consultation
- Curriculum design and writing
- Training
- Curriculum implementation cycle

What happened at JHU:
- Committee structure
  - Key stakeholders
  - Students
  - Thought Leaders
  - Invited Guests
- Annual faculty retreats
  - Strategic planning
- Transition Planning

*www.ibe.unesco.org/Curriculum/Rpack/capacitybuilding.htm
What did it take to achieve a comprehensive curriculum reform?

III. Operational function*
Assessment of teaching and learning
Supervision
Monitoring
Implementation

What happened at JHU:
• Student Assessment & Program Evaluation Committee Rapid Review
• Budgeting process
• GTS Integration Committee
  – Key stakeholders
  – Students
  – Reports to EPCC

*www.ibe.unesco.org/Curriculum/Rpack/capacitybuilding.htm
“Education is not the filling of a pail, but the lighting of a fire.”

-William Butler Yeats
Implementation Committee

Genes to Society Integration Committee† (GTSIC)

GTS Oversight Committee†
- Horizontal Strands
  - Biomedical
  - Behavioral & Social Sciences
- Assessment & Grading Policy†

New Courses
- Transitions to the Wards
- Intersessions
- Transition to Residency

Faculty Development
- Active Learning
- Educational Technology†

Marketing & Communications
- Website
- Newsletter
- Item Writing

4) Communicate the Vision*

†Student membership

*John Kotter, Leading Change, 1996