Transitioning to an Integrated Curriculum: Challenges, Opportunities and Student Performance in Gross Anatomy

Todd Hoagland, PhD
Department of Cell Biology, Neurobiology & Anatomy
Medical College of Wisconsin
Curriculum Timeline

- ✓ MCW hires new Dean with ambitious curriculum plans
- ✓ Planning starts for Pilot Integrated Curriculum
- ✓ Decision made to use 100% TBL & Labs with no Lectures
- ✓ Basic science Chairs write letter to Dean about problems with PIC and all sign
- ✓ Dean steps down
- ✓ Planning for new curriculum begins
- ✓ PIC goes live with 28 students out of a class of 204. 176 still in classical curriculum
- ✓ Discovery curriculum launched
- ✓ Discovery curriculum goes live with 28 students out of a class of 204. 176 still in classical curriculum
- ✓ USMLE scores for PIC and Classical curriculum received
- ✓ Analysis and debriefing of Fall semester

2008
- ✓ Curriculum retreat held to consider change – mandated 20% reduction in course time

2009
- ✓ Interactive learning hallmark of the new curriculum

2010
- ✓ Classical Curriculum
- ✓ Pilot Integrated Curriculum (PIC; M1 & 2)
- ✓ Discovery Curriculum

2011
- ✓ Decision made to use 100% TBL & Labs with no Lectures
- ✓ Basic science Chairs write letter to Dean about problems with PIC and all sign

2012
- ✓ Planning for new curriculum begins
- ✓ M1 Discipline-based and M2 Systems-based (Hybrid PIC & Classical)

2013
- ✓ Discovery curriculum launched
- ✓ Analysis and debriefing of Fall semester
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VISIONING SESSIONS

What is important to us/you?
Transitioning to an Integrated Curriculum

Identify and Prioritize
- Important Features & Potential Obstacles

- FEATURES
  - MORE GENERAL LTE
  - MORE GENERAL LTE SPACE THAT ARE ACCESSIBLE AND ARE OWNED BY SAME
  - BETTER SCHEDULING PROCESS (ACCESS TO VIEW AVAILABILITY OF ROOMS & RESOURCES)
  - WIFI SPOTS (BUT ACCESSIBLE TO WORKSTATIONS AVAILABLE)

- OBSTACLES
  - LACK OF SHARED VISION
  - DON'T KNOW WHAT I DON'T KNOW
  - WHAT ADJACENCIES COULD I BENEFIT FROM?
  - NOT KNOWING HOW TO USE TECHNOLOGY
  - NOT COMFORTABLE WITH THE SIMILARITY OF ACCESSIBILITY

- MOST IMPORTANT
  - COLLABORATIVE LEARNING
  - VENTILATION
  - APPROPRIATE CLIMATE (WINTER)
  - LOTS OF NATURAL LIGHT & SPACE
  - POTENTIAL
  - ADEQUATE SPACE TO ACCOMPLISH ALL NEEDS
  - UNFORESEEABLE TECHNOLOGY
  - ADJUSTABLE FURNITURE FOR ALL GAMES

- IMPORTANT
  - ORAL FORCED FUNCTION
  - WORKSHOPS
  - HOW EDUCATION IS ACCOMPLISHED
  - LARGE CLASS
  - SIMULTANEOUS TESTING
  - 200X+ 2

- OBSTACLES
  - SPACE TO ACCOMMODATE LARGE STUDENT POPULATION
  - FOUR WALLS
  - NO OPPORTUNITY TO WORK NEEDED
  - ASKING LEARNING IN FREE SPACE
  - SIMULTANEOUS TESTING
  - CONFIDENTIAL NETWORK (RELIABLE)
  - Available but not compromised
Innovative Curriculum Demands Renovations

**Enhanced Study, Lounge and Collaboration Areas**
- Provide new study and collaboration spaces
- Enhance existing spaces in and around Cafeteria

**Renovated Clinical Human Anatomy Lab**
- Upgraded dissection lab, classroom and added locker rooms
- Technology to display radiological images and anatomical videos

**New Active Learning Classroom**
- Flat space large enough for entire class, working in teams and with technology to facilitate large group activities and discussion
- Space will be available for student study when not in use

**Learning & Skills Classrooms**
- Patient examination rooms, small group learning, flexibility to expand rooms via dividers to create moderate and large group spaces
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MCW commits to active student dissection

Old Anatomy Laboratory
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Curriculum change has some perks...

2nd Floor – Looking South
Same vantage point as previous rendering
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Transitioning to an Integrated Curriculum
Transitioning to an Integrated Curriculum

Dissection Lab - Renovation

Before

After
Curriculum Timeline

Classical

PIC (n=28)

Classical (n=176)

Discovery

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April 23, 2013

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Design Principles

• Adhere to LCME standards and (existing or revised) MCW curricular global objectives.

• The guiding principles that were developed over the course of several faculty retreats include:
  – Early clinical patient contact
  – Integration of basic and clinical sciences
  – Building on strengths of the current MCW program
  – Competency-based curriculum
Pilot Integrated Curriculum (PIC; 2010)

- 28 out of 204 students participated
- Completely integrated
- Systems-based
- No lectures, all Team-based learning (M-F, 1-5)
- Modules co-directed by basic scientist and MD
- The PIC and Traditional curriculum were being run concurrently so double-teaching
# Transitioning to an Integrated Curriculum

<table>
<thead>
<tr>
<th>August</th>
<th>September</th>
<th>October</th>
<th>November</th>
<th>December</th>
<th>January</th>
<th>February</th>
<th>March</th>
<th>April</th>
<th>May</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Principles</td>
<td>Musculoskeletal &amp; Skin Module</td>
<td>Cardiovascular, Respiratory and Renal Module</td>
<td>GI, Nutrition and Metabolism Module</td>
<td>Reproductive Medicine Module</td>
<td><strong>NBME Exams</strong></td>
<td><em>Kidney dissection before peritoneal cavity</em></td>
<td><em>No oral cavity yet</em></td>
<td></td>
<td></td>
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Longitudinal Patient Panel

Pathway Activities

<table>
<thead>
<tr>
<th>August</th>
<th>September</th>
<th>October</th>
<th>November</th>
<th>December</th>
<th>January</th>
<th>February</th>
<th>March</th>
<th>April</th>
<th>May</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endocrine Module</td>
<td>Brain, Mind &amp; Behavior</td>
<td>Hematology, Lymphatic System and Neoplasia</td>
<td>Infections and Inflammation Module</td>
<td>Symptoms-Based Presentations</td>
<td><strong>USMLE Board Prep</strong></td>
<td></td>
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</tr>
</tbody>
</table>

Longitudinal Patient Panel

Pathway Activities

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Competency Based – ACGME 6 Core Competencies

- Competency 1 – Patient Care
- Competency 2 – Medical Knowledge
- Competency 3 – Interpersonal and Communications Skills
- Competency 4 – Practice-based Learning and Improvement
- Competency 5 – Professionalism
- Competency 6 – Systems-Based Practice

Accreditation Council for Graduate Medical Education; http://www.acgme.org/
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Competency Based – ACGME 6 Core Competencies

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Accreditation Council for Graduate Medical Education; http://www.acgme.org/
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- Base it on Adult learning theory
- Active learning is paramount (laboratory dissection)
- Integrate Gross Anatomy throughout curriculum. Large bolus up front and then spaced repetition with increasing complexity

![Diagram showing emphasis on Basic Science and Clinical Science over time.](image-url)
Adult Learning Theory Drives Pedagogy

- Focus on student learning not faculty teaching
- Active learning
  - Interactive (Audience Response System, ARS)
  - Problem or case based modules
  - Practical/Clinical application of content
  - Make large groups interactive (Team-Based Learning, TBL)
- Self directed (foster life-long learning)
- Use prior skills or knowledge of the learner

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Adult Learning Theory Drives Pedagogy (cont.)

• Adults are goal-oriented
• Adults are relevancy-oriented
• Adults need to participate in small-group activities during the learning to move beyond understanding to application, analysis, and evaluation.
• Adult learning has ego involved. Professional development should be structured to provide support from peers and to reduce the fear of judgment during learning. Create classroom environment where students feel safe to contribute and self-confident enough to ask questions.

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Outcomes – Practical Exam comparison

<table>
<thead>
<tr>
<th>Topic</th>
<th>Classical</th>
<th>PIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Musculoskeletal Skin (n=17)</td>
<td>87.8%</td>
<td>84.3%*</td>
</tr>
<tr>
<td>CV / Resp. / Renal (n=13)</td>
<td>86.9%</td>
<td>85.4%</td>
</tr>
<tr>
<td>Gastrointestinal / Nutrition (n=18)</td>
<td>88.1%</td>
<td>83.7%*</td>
</tr>
<tr>
<td>Reproductive (n=14)</td>
<td>86.2%</td>
<td>81.5%*</td>
</tr>
</tbody>
</table>

* Statistically significant
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Outcomes – Written Exam comparison

<table>
<thead>
<tr>
<th>Topic</th>
<th>Classical</th>
<th>PIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Musculoskeletal Skin (n=11)</td>
<td>84.3%</td>
<td>84.7%</td>
</tr>
<tr>
<td>CV / Resp. / Renal (n=15)</td>
<td>83.8%</td>
<td>84.4%</td>
</tr>
<tr>
<td>Gastrointestinal / Nutrition (n=9)</td>
<td>85.2%</td>
<td>83.9%</td>
</tr>
<tr>
<td>Reproductive (n=7)</td>
<td>82.2%</td>
<td>82.9%</td>
</tr>
</tbody>
</table>

No significant differences
MCW at a crossroads. Do we go back to Traditional, continue with Integrated or develop a third option to Hybridize the curriculum? Students surveyed...

With the three proposals in mind, what learning format(s) for M1-M2 material do you prefer to support?

- ANGEL-based learning modules
- Computer-based simulation
- Lab
- Live F2F Lecture
- TBL

- PBL
- Recorded Lecture
- Small group discussion
- Podcasts
- Simulation
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Student feedback (n=379 of 800+) about desired pedagogy
1=Strongly preferred, 2=Preferred, 3=Not preferred

Favorite Pedagogy

Least Favorite Pedagogy
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Students surveyed (cont.)...

Rate the efficiency of each method listed below for how you learn material in a way that best supports your learning style:

- ANGEL-based learning modules
- Computer-based simulation
- Lab
- Live F2F Lecture
- TBL
- PBL
- Recorded Lecture
- Small group discussion
- Podcasts
- Simulation
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Student feedback (n=379 of 800+) about desired pedagogy
1=Highly efficient, 2=Efficient, 3=Not efficient, 4=Highly inefficient

- Most efficient
- Least efficient way they prefer to learn
“A mixture of multiple learning formats would be beneficial as it would allow students with varying learning styles to fit in well.”

“Based on experiences with TBL's: many students stated they would not have applied to MCW and could not recommend MCW if the curriculum is solely TBL.”

“Methodical implementation of a new curriculum with a gradual implementation of new learning formats.”
2012 Medical School Graduation Questionnaire
18. Indicate your level of satisfaction with the following: Student Support, Personal Counseling

<table>
<thead>
<tr>
<th>School, Year</th>
<th>Very Dissatisfied</th>
<th>Dissatisfied</th>
<th>Neutral</th>
<th>Satisfied</th>
<th>Very Satisfied</th>
<th>Mean</th>
<th>Count</th>
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<tbody>
<tr>
<td>MCW 2008</td>
<td>0.5</td>
<td>4.2</td>
<td>41.7</td>
<td>35.4</td>
<td>18.2</td>
<td>3.7</td>
<td>192</td>
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<tr>
<td>MCW 2009</td>
<td>2.4</td>
<td>6.6</td>
<td>37.0</td>
<td>44.1</td>
<td>10.0</td>
<td>3.5</td>
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</tr>
<tr>
<td>MCW 2010</td>
<td>0.0</td>
<td>2.8</td>
<td>25.0</td>
<td>38.9</td>
<td>33.3</td>
<td>4.0</td>
<td>36</td>
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<tr>
<td>MCW 2011</td>
<td>1.3</td>
<td>4.0</td>
<td>12.0</td>
<td>45.3</td>
<td>37.3</td>
<td>4.1</td>
<td>75</td>
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<tr>
<td>MCW 2012</td>
<td>2.5</td>
<td>19.8</td>
<td>21.0</td>
<td>46.9</td>
<td>9.9</td>
<td>3.4</td>
<td>81</td>
</tr>
<tr>
<td>All Schools</td>
<td>3.7</td>
<td>8.0</td>
<td>12.6</td>
<td>37.8</td>
<td>37.9</td>
<td>4.0</td>
<td>6589</td>
</tr>
</tbody>
</table>

Lots of stress with multiple concurrent curriculums – for faculty members and students
Outcomes...

- PIC students on average did not perform as well as the Classical curriculum students on practical exams.
- PIC students did as well as Classical curriculum on written exam questions.
- USMLE: Classical curriculum outperformed PIC.
- Students don’t feel as supported and personal connections with students were more challenging with two concurrent curriculums.
PIC – Pitfalls...

- Significant increase in upfront work for faculty (Learning assignments, Learning objectives, RATs, Application exercises)
- Coordinating activities of numerous basic scientists and clinicians from many different departments was challenging
- Covering the breadth of the discipline using only TBL
- Non-science majors struggled
PIC – Pitfalls...

- Students not as invested in the anatomy lab dissections considering they were spread out over 14 months and it did not count much toward unit grade.
- Difficult for basic scientist to feel comfortable with leading discussions with lots of integrated content (multiple disciplines)
- Difficult to pry clinicians out of clinics
- Cost of running curriculum with more MDs increases significantly
Successes...

- Placing content in a context where its relevance is apparent is a winner!
- Superb early student mentorship
- Improved student problem solving skills
- Greater student accountability
- Increased collaboration (MD & PhD)
- Improved curriculum integration
Successes cont.

- Assessments better match our learning outcomes and expectations
- Increased focus on medical education scholarship
- Students started using their textbooks again
- Outstanding new facilities to support curriculum
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What features of the module enhanced your learning?

➢ “We were exposed to a great deal of difficult clinical scenarios and I appreciated such early exposure to such mature situations.”
➢ “The anatomy labs were absolutely crucial to the enhancement of our learning.”
➢ “The physical exam sessions were excellent and enhanced the connection between clinical experiences and basic anatomy.”
➢ “Finally, the presence of basic science and clinical professors at every TBL session was wonderful.”
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What features of the module **enhanced** your learning?

“I felt that the collaboration of experts enhanced our learning and understanding of the material. In encouraged critical thinking of relating science principles to clinical skills. It also allowed us to see a variety of different clinicians and ask questions about future specialties.”
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What features of the module inhibited your learning?

“Anatomy needs to be taught in a different manner, or at least tutoring needs to be added in. Having class time twice a week (with two completely separate labs) for only 2-3 hours each time with an instructor present is not nearly enough to master the material nor have a very good foundation to learn it ourselves.”

“Anatomy lab should have had mini lectures, it was hard to learn the things on our own.”
Take Home Message...

• A hybrid (mixed) curriculum can help level the knowledge gap between science and non-science majors (disciplines 1st, systems after)
• When integration is done well it is awesome
• It is very challenging to do integration well without strong clinician contributions
• Significant faculty development is necessary to do it well
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Decision is made to Hybridize ... Discipline-based M1 year, Organ-based M2 year:

<table>
<thead>
<tr>
<th>Week No.</th>
<th>M1 Fall Semester</th>
<th>M1 Spring Semester</th>
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</thead>
<tbody>
<tr>
<td>Month</td>
<td>July</td>
<td>August</td>
</tr>
<tr>
<td>Courses</td>
<td>Physiology</td>
<td>Molecules to Cells: Biochemistry, Genetics, Human Development, Cell &amp; Tissue Biology</td>
</tr>
<tr>
<td></td>
<td>CLA</td>
<td>Orientation</td>
</tr>
<tr>
<td>Early Clinical</td>
<td>Foundations of Clinical Medicine</td>
<td>Winter Break</td>
</tr>
<tr>
<td>Pathways</td>
<td>ITP</td>
<td>Activities, Core Sessions, Extended General Exposure</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Week No.</th>
<th>M2 Fall Semester</th>
<th>M2 Spring Semester</th>
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</thead>
<tbody>
<tr>
<td>Month</td>
<td>July</td>
<td>August</td>
</tr>
<tr>
<td>Units</td>
<td>Intro-MSS</td>
<td>Cardiovascular</td>
</tr>
<tr>
<td>Early Clinical</td>
<td>Bench to Bedside</td>
<td>Clinical Apprenticeship</td>
</tr>
<tr>
<td>Pathways</td>
<td>Pathway Activities, Core Sessions</td>
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Week No. Key:
- Scheduled Exam(s)
- School Breaks

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Thank you for your attention!

What questions do you have for me?

Contact information: thoagland@mcw.edu
Office: 414-955-7560