TRANSFORMING MEDICAL EDUCATION WITH INNOVATIVE, INTEGRATED CURRICULA

Yen-Ping Kuo, PhD

School of Osteopathic Medicine
Campbell University
United States of America
PRESENTATION ROADMAP

INTRODUCTION:
- Osteopathic Medicine
- History of Curricular Integration

INTEGRATED CURRICULUM MODELS

EXPERIENCE & PERSPECTIVES
OSTEOPATHIC MEDICINE/ DO IN BRIEF

• Founded in the late 1800s by A. T. Still, MD.
• Osteopathic medicine emphasizes structure and function relationship, health promotion and disease prevention.
• DOs are trained to treat patients with all modern modalities AND with osteopathic manipulation, and are licensed to practice the full scope of medicine in all 50 states.
• Osteopathic medical schools, in general, place a stronger teaching emphasis on faculty.
Currently, Approximately 25% of the US medical students are training to be DOs.
HISTORICAL DEVELOPMENTS OF MEDICAL EDUCATION CURRICULA

Apprenticeship (18th–19th centuries)
- Flexner Report (1910)
- Case Western Reserve University (1952)

Competency-based (1998)
- CP Integrated (1995)
- Problem-Based Learning (1968)

Spiral Curriculum (1999)
- Experience-based learning (2004)
- Longitudinally integrated clerkships (2005)

Reviewed by Kusurkar, et al., Academic Medicine, 2012
MOTIVATIONS BEHIND MODERN TRANSFORMATION

Education Psychology Theories

Requirements by Medical Education Organizations

AACOM
AMERICAN ASSOCIATION OF COLLEGES OF OSTEOPATHIC MEDICINE
PRINCIPLES OF MEDICAL EDUCATION INNOVATION

- Competencies
- Assessment
- LOT-based Curriculuar Content & Design

Backward Design
Forward Planning
Integration of What? Integration is not automatic just because we teach them together.

**INTRODUCTION:**
- Osteopathic Medicine
- History of Curricular Integration

**INTEGRATED CURRICULUM MODELS**
THE CHARACTERISTICS OF AN INTEGRATED CURRICULUM

- Break down barriers between the basic and clinical sciences
- Promote acquisition, retention, and progressive development of knowledge and skills
- Facilitate applications of concepts
HOW MUCH INTEGRATION?
The Integration Ladder

- Fusion
- Authentic integration

(Harden, Medical Education, 2000)
HOW TO INTEGRATE?

Methods Of Integration

- **Horizontal:**
  - integration across disciplines but within a finite period of time
  - example: a combined year/semester-long, single basic science course

- **Vertical/Z-Shape**

- **Spiral**
Z SHAPE VERTICAL INTEGRATION

year 6
clinical

year 5
practice

year 4
Basic
& classroom

year 3
& classroom

year 2
teaching

much independence and responsibility

much guidance and classroom education

clinical

practice

basic

science

& classroom

& classroom
Topics are revisited

The topics visited are addressed in successive levels of difficulty.

New learning is related to previous learning

The learner's competence increases progressively until the final overall objectives are achieved.

Harden & Stamper, 1999
INTEGRATED CURRICULUM MODELS

Problem-Based:
student-lead, open-end learning thru problem solving

Case-Based:
Teaching with cases and with predetermined terminal objectives

Clinical presentation:
Expert-guided learning in an inductive clinical framework
PRESENTATION ROADMAP

INTRODUCTION:
- Osteopathic Medicine
- History of Curricular Integration

INTEGRATED CURRICULUM MODELS

EXPERIENCE & PERSPECTIVES
A T Still University
School of osteopathic medicine at Arizona (ATSU-SOMA)

The first Clinical Presentation Curriculum in the US
A CP CURRICULUM IN BRIEF

- **Principle:** ~120-125 the most common presenting signs or symptoms identified and their inductive reasoning **schemes** developed.

- **Design:** Scientific concepts applicable in the decision-making process for the scheme are identified and presented **in the context of the scheme.**

- **Expected Outcome:** Enhances memory organization and improving diagnostic success.

Mandin, H., et al. Academic Medicine, 1995

Medical Education 2000
ATSU-SOMA’S CP-BASED, INTEGRATED CURRICULUM (as 2013)

All CP Schemes are assigned to organ system courses in the first two years and then revisited during clerkship years.

<table>
<thead>
<tr>
<th>WK</th>
<th>Organ System Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 WK</td>
<td>Biomed Sci, Neuro-MSK, Cardio-Pulmonary</td>
</tr>
<tr>
<td>11 WK</td>
<td>Renal, Endo, GI</td>
</tr>
<tr>
<td>11 WK</td>
<td>Anatomy, OMM, Clinical Skill</td>
</tr>
</tbody>
</table>

| 9    | Reprod/Urol, Sense, Human Dev, Hematology, Derm, Mind, Integrative Prep              |
| 3    |                                                                      |
| 4    |                                                                      |
| 6    |                                                                      |
| 3    |                                                                      |
| 4    |                                                                      |
| 4    |                                                                      |
| 5    |                                                                      |

EARLY CLINICAL IMMERSION IN CHC ACROSS THE US
<table>
<thead>
<tr>
<th></th>
<th>CP SCHEMES PRESENTED IN ATSU-SOMA NEURO SCIENCE COURSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>• Headache</td>
</tr>
<tr>
<td>2</td>
<td>• Acute neurological deficits</td>
</tr>
<tr>
<td>3</td>
<td>• Seizure</td>
</tr>
<tr>
<td>4</td>
<td>• Altered Mental Status</td>
</tr>
<tr>
<td>5</td>
<td>• Dizziness, Numbness, Tingling</td>
</tr>
<tr>
<td>6</td>
<td>• Weakness</td>
</tr>
<tr>
<td>7</td>
<td>• Gait and Movement Disturbance</td>
</tr>
</tbody>
</table>
Headache

Primary
- Migraine
  - Tension
  - Cluster
  - Other
- Non-migraine

Secondary
- Endogenous
  - Intracranial
    - Vascular
    - Nonvascular
  - Cranial Neuralgias
- Other
- Exogenous
  - Trauma
  - Substance
  - Infection
LEARNING ACTIVITIES WITHIN A CLINICAL SCHEME IN YEARS 1&2

Scheme Introduction

Disassemble the “Big Picture”

Re-assemble “Big Picture”
By Recapitulation, Case groups, Simulation
### "HEADACHE" UNIT IN A GLANCE

<table>
<thead>
<tr>
<th>Time</th>
<th>Monday 10/10</th>
<th>Tuesday 10/11</th>
<th>Wednesday 10/12</th>
<th>Thursday 10/13</th>
<th>Friday 10/14</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 – 9:00</td>
<td>Course Introduction (Pong/Kuo)</td>
<td>Electrophysiology of Neurons (Pong/Sullivan)</td>
<td>Synaptic Transmission and Neurotransmitters (Pong/Kuo) (Kuo for 1.5 hrs)</td>
<td>OPP &amp; Medical Skills</td>
<td>Pharm of Migraine Headache Medications (Wightkin)</td>
</tr>
<tr>
<td>9:00 – 10:00</td>
<td>Headache Scheme Presentation (Pong)</td>
<td>(Pong)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:00 – 11:00</td>
<td>Gross Brain Anatomy (Anatomy, Wienke)</td>
<td>Brain/Neuronal Metabolism (Hansen)</td>
<td>Primary Headache Disorders (Root)</td>
<td></td>
<td>Pathology of Secondary Headaches (Fischione)</td>
</tr>
<tr>
<td>11:00 – 12:00</td>
<td>Anatomy Brain Cytology (Anatomy, Hu)</td>
<td>Early Development of the Nervous System (embryology) (Fischione)</td>
<td>Secondary and Other Headache Disorders (Root)</td>
<td></td>
<td>Microbiology of CNS Infections I (Kuo)</td>
</tr>
<tr>
<td>12:00 – 1:00</td>
<td>Lunch</td>
<td>Lunch</td>
<td></td>
<td></td>
<td>Headache Scheme Wrap-Up</td>
</tr>
<tr>
<td>1:00 – 2:00</td>
<td>Cultural Diversity (Ratto)</td>
<td>Anatomy of Cranial Nerves (Anatomy, Olson)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:00 – 3:00</td>
<td>Cultural Diversity (Slices, Hu)</td>
<td>CNS Imaging (Makin)</td>
<td></td>
<td></td>
<td>Small Group</td>
</tr>
<tr>
<td>3:00 – 4:00</td>
<td>Anatomy</td>
<td></td>
<td></td>
<td></td>
<td>Anatomy (Cranial nerves, foramen)</td>
</tr>
<tr>
<td>4:00 – 5:00</td>
<td>Cultural Diversity (Ratto)</td>
<td></td>
<td></td>
<td></td>
<td>Small Group</td>
</tr>
</tbody>
</table>

**CAMPBELL UNIVERSITY**

Jerry M. Wallace
School of Osteopathic Medicine
EXAMPLE OF SPIRAL INTEGRATION OF MICROBIOLOGY/ID in a CP CURRICULUM
HOW WELL DID IT WORK?
-Student Perspectives-

▪ Academic Transition?
▪ Learning Motivation?
▪ Board Performance?
▪ Use of basic science knowledge in clinical reasoning?
▪ Transition/matching to residency?

▪ Challenging for Many
▪ Extremely high early
▪ Passing rate OK but “more” to be desired**
▪ SHINE
▪ “Star” students (who have the number AND skills) have huge edge

Perhaps, there additional selection factors that should be considered during admission process?
WHAT ARE NEEDED TO INCREASE THE SUCCESS IN A CPC?

-Educator/Institutional Considerations-

▪ Involve the “right” ones
  • Team-player trait is essential
  • Willingness to step out of PhD-MD-DO comfort zones

▪ Heavy Faculty development
  • Education theory
  • Teaching techniques/modality

▪ Dedicated teaching and planning responsibility
  • Content mapping/tracking required
  • Program-specific faculty appointment desired
# CUSOM’S HYBRID CURRICULUM

## Year 1

<table>
<thead>
<tr>
<th>SEMESTER 1</th>
<th>SEMESTER 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cell Bio&amp; Biochem, Micro &amp; Immun</td>
<td>Physiology, Pathology, Pharmacology</td>
</tr>
<tr>
<td></td>
<td>Musculoskeletal System</td>
</tr>
<tr>
<td></td>
<td>Neurosensory Psychiatry</td>
</tr>
<tr>
<td><strong>Anatomy, Clinical Skill, OMM, PCC, FMP</strong></td>
<td></td>
</tr>
</tbody>
</table>

## Year 2

<table>
<thead>
<tr>
<th>SEMESTER 1</th>
<th>SEMESTER 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular System, Respiratory System</td>
<td>Hematology, Dermatology, Renal System</td>
</tr>
<tr>
<td></td>
<td>Endocrine, GI Systems</td>
</tr>
<tr>
<td></td>
<td>Reproductive System, COMLEX I prep, Introduction to Clinical Clerkships</td>
</tr>
<tr>
<td><strong>Clinical Skill, OMM, PCC, FMP</strong></td>
<td></td>
</tr>
</tbody>
</table>
### Block 1 - Week 1 - 2017

**Block Leaders:** Dr. Kuo / Dr. Powers / Dr. Terreberry

<table>
<thead>
<tr>
<th>Time</th>
<th>Monday, July 31, 2017</th>
<th>Tuesday, August 1, 2017</th>
<th>Wednesday, August 2, 2017</th>
<th>Thursday, August 3, 2017</th>
<th>Friday, August 4, 2017</th>
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</thead>
<tbody>
<tr>
<td>08:00</td>
<td>Cell Biology/Biochemistry 01</td>
<td>Cell Biology/Biochemistry 01</td>
<td>Cell Biology/Biochemistry 01</td>
<td>Cell Biology/Biochemistry 11</td>
<td>Study Techniques Development 1</td>
</tr>
<tr>
<td>08:30</td>
<td>Water, pH and Buffers</td>
<td>Cell Membrane</td>
<td>Transcription</td>
<td>Protein Trafficking and Degradation</td>
<td></td>
</tr>
<tr>
<td>09:00</td>
<td>Dr. Troise</td>
<td>Dr. Danelson</td>
<td>Dr. Luhta</td>
<td>Dr. Luhta</td>
<td>Study Techniques Development 1</td>
</tr>
<tr>
<td>09:30</td>
<td>Cell Biology/Biochemistry 02</td>
<td>Cell Biology/Biochemistry 08</td>
<td>Dr. Luhta</td>
<td>Cell Biology/Biochemistry 12</td>
<td>Clinical Skills Case 1</td>
</tr>
<tr>
<td>10:00</td>
<td>Dr. Luhta</td>
<td>Dr. Danelson</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>10:30</td>
<td>Cell Biology/Biochemistry 13</td>
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<td></td>
</tr>
<tr>
<td>11:00</td>
<td>Antisense Oligonucleotides</td>
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<tr>
<td>11:30</td>
<td>Dr. Luhta</td>
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<tr>
<td>12:00</td>
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</tr>
<tr>
<td>12:30</td>
<td>Lunch</td>
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<tr>
<td>13:00</td>
<td>Anatomical Terminology</td>
<td>OMM Lab 1</td>
<td>ExamSoft Training</td>
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<tr>
<td>13:30</td>
<td>Dr. Mitchell</td>
<td></td>
<td></td>
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<tr>
<td>14:00</td>
<td></td>
<td>Palpation, Landmarks, Somatoform Dysfunction</td>
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<tr>
<td>14:30</td>
<td></td>
<td>Review of ExamSoft and Mock Exams</td>
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<tr>
<td>15:00</td>
<td></td>
<td>Professional Etiquette</td>
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<tr>
<td>15:30</td>
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<tr>
<td>16:00</td>
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<td>16:30</td>
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<tr>
<td>17:00</td>
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</tbody>
</table>

**Course Directors:** Anatomy Dr. Mitchell, Cell Biology/Biochemistry Dr. Troise, Clinical Skills Dr. Kuo, OMM Dr. Danelson, Microbiology/Immunology Dr. Kuo, OMM Dr. Luhta, FCC Dr. Lee-Doyle & Mt. Short

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**Basic Science**

**Horizontal Integration**

**Full Integration by Case Conference**
Clinical & Basic Science Vertical Integration
SUMMARY OF CUSTOM CURRICULUM IN THE INTEGRATION LADDER

- Primarily Z-shape
- Vertical integration in system-based courses
- Some degrees of horizontal integrations during first two blocks
- Simulation Medicine and Friday Case Conferences provide full integration experiences and with spiral integration into years 3&4.
HOW WELL HAS IT WORKED?
-Student Perspectives-

- Academic Transition?
- Learning Motivation?
- Board Performance?
- Use of basic science knowledge in clinical reasoning?
- Transition/matching to residency?

- Average
- Higher in System Courses and during Simulation
- SHINE**
- Gradual growth
- Shine; most likely due to high Board performance
CUSOM STUDENTS LICENSING EXAM PERFORMANCE

Last updated: 10/2/2017

<table>
<thead>
<tr>
<th>Student Performance</th>
<th>COMLEX-USA Level 1</th>
<th>COMLEX-USA Level 2CE</th>
<th>COMLEX-USA Level 2PE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Class of 2017</td>
<td>Class of 2018</td>
<td>Class of 2019</td>
</tr>
<tr>
<td></td>
<td>92.95% (n=144/155)</td>
<td>92.76% (n=144/155)</td>
<td>98.72% (n=154/156)</td>
</tr>
<tr>
<td></td>
<td>(92.28% Nat'l Mean)</td>
<td>(92.68% Nat'l Mean)</td>
<td>(96.54% Nat'l Mean)</td>
</tr>
<tr>
<td></td>
<td>21.79% (n=35)</td>
<td>16.77% (n=26)</td>
<td>36.55% (n=53)</td>
</tr>
<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Class of 2017</td>
<td>Class of 2018</td>
<td>Class of 2019</td>
</tr>
<tr>
<td></td>
<td>98.69% (n=151/154)</td>
<td>95.95% (n=143/149)</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>(93.20% Nat'l Mean)</td>
<td>(95.83% Nat'l Mean)</td>
<td>(Nat'l Mean NA)</td>
</tr>
<tr>
<td></td>
<td>39.86% (n=60)</td>
<td>33.56% (n=50)</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Class of 2017</td>
<td>Class of 2018</td>
<td>Class of 2019</td>
</tr>
<tr>
<td></td>
<td>96.80% (n=149/154)</td>
<td>98.00% (n=98/100)</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>(92.90% Nat'l Mean)</td>
<td>(Nat'l Mean NA)</td>
<td>(Nat'l Mean NA)</td>
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</tbody>
</table>

- Class of 2017 had mean discipline score for Level 1 ranking CUSOM #11 out of 48 COMs
COMPARATIVE PERFORMANCE OF SCHOOL MEAN SCORES ON COMLEX-USA LEVEL 2-CE

(Campbell University Jerry M. Wallace School of Osteopathic Medicine)

The red bar represents your school's performance while the red line represents the national mean.

National Mean 542.60

Mean Score +/-1 Standard Deviation

Rank

The red bar represents your school's annual performance. To meaningfully compare your school's annual performance to other schools, please take the standard deviation into account e.g., the line with upper and lower bars.

The mean score for your school is 575.07 and the standard deviation is 101.94.

575.07
COMPARATIVE PERFORMANCE OF SCHOOL PASSING RATES ON COMLEX-USA LEVEL 2-CE

(June 2016 - May 2017 First-Time Takers Only)

Campbell University Jerry M. Wallace School of Osteopathic Medicine
(The red bar represents your school's performance)
CUSOM CLASS 2017 RESIDENCY MATCH

- NRMP Match: 43%
- NMS Match: 51%
- Military Match: 6%

100% Placement
OPPORTUNITY FOR IMPROVEMENT?
-Educator/Institutional Perspectives-

- Map biomedical science into Years 3 and 4
- Blur basic science discipline boundaries
- Build spiral integration
- Increase interdisciplinary teaching/learning
- Convert lower-order to higher-order teaching/learning activities
THE FUTURE OF MEDICAL EDUCATION? CHALLENGES?

- In 2000, Harden “predict” the medical education for 2015: (Harden, R M. Medical Teacher, 2000)
  - Many have happened: ex. technology influenced, student-centered, outcome-based
  - Many are happening: adaptive curriculum, student-planned, community focused
- Changing an existing curriculum is difficult, but....
- Innovation is easier by starting new, but....
“Good business leaders create a vision, articulate the vision, passionately own the vision, and relentlessly drive it to completion.”

-John Francis "Jack" Welch-
Thank you!!