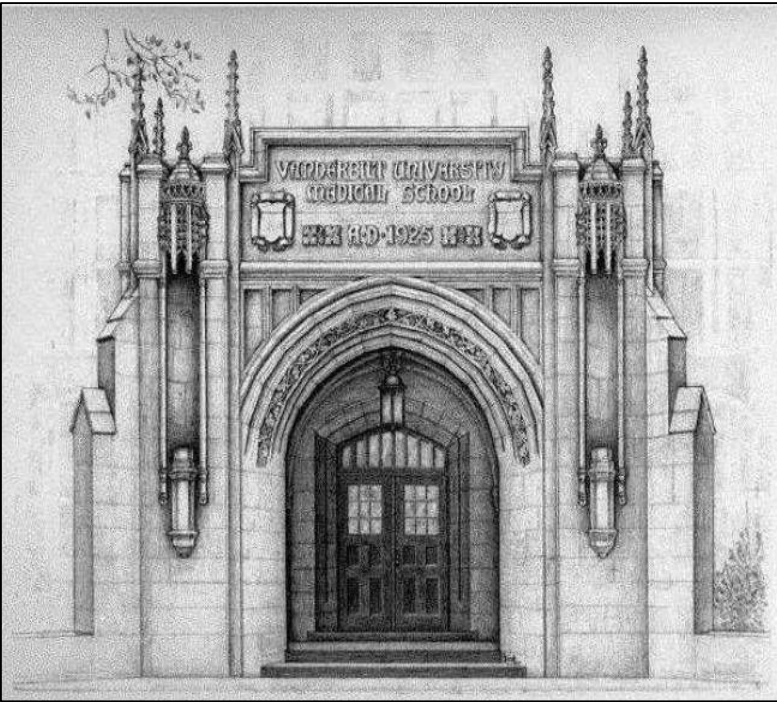


Constructing Integrated Curricula across the Medical School Continuum

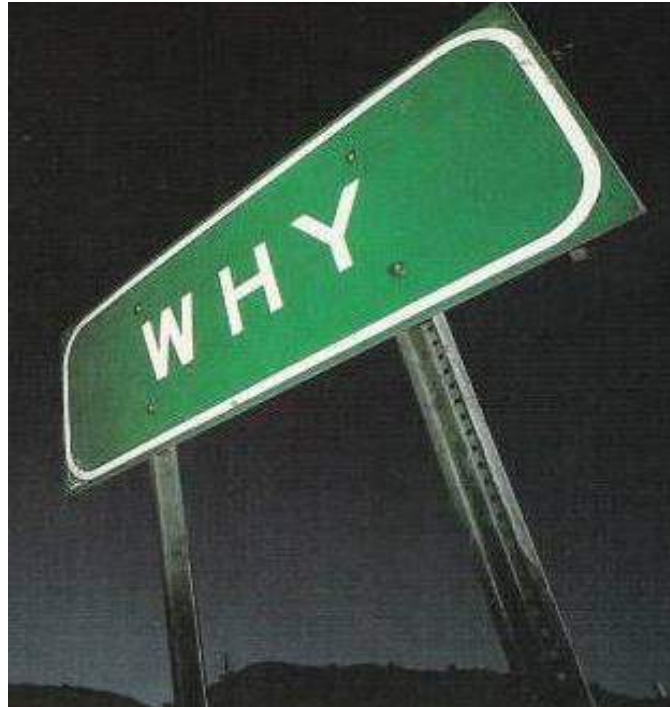


Neil Osheroff, Ph.D.

Vanderbilt University School of Medicine
Professor of Biochemistry and Medicine
John G. Coniglio Chair in Biochemistry
Director, Academy for Excellence in
Education
Treasurer, IAMSE



Why is it important to integrate foundational science with clinical science?



“AAMC Reviewer: Novel concept but is this important?”

Foundational Science in an Integrated Curriculum

Flexner Revisited: The Role and Value of the Basic Sciences in Medical Education

Edward P. Finnerty, PhD, Sheila Chauvin, MEd, PhD, Giulia Bonaminio, PhD,
Mark Andrews, PhD, Robert G. Carroll, PhD, and Louis N. Pangaro, MD
Acad. Med., 2010

IAMSE-initiated study

Driven by “perceived reduction
in time and focus on
foundational sciences”

Value and Role:

“Sciences are not simply a compendium of facts but an integrated approach to problem-solving, a framework for understanding perturbations of normal functions, and a means to predicting the potential outcomes.”

When and How:

“...sciences should be studied early and often **throughout** the UME experience.”

Foundational Science in an Integrated Curriculum

the role of basic science

Preparing medical students for future learning using
basic science instruction

Maria Mylopoulos¹ & Nicole Woods²

Med. Educ., 2016

“...ability to **learn** new information from available resources, relate new learning to past experiences and demonstrate innovation and flexibility in problem solving.”

Conclusions:

Our results show that the inclusion of basic sciences instruction **enhanced the learning of novel related content**.

Cause and Effect: Testing a Mechanism and Method for the Cognitive Integration of Basic Science

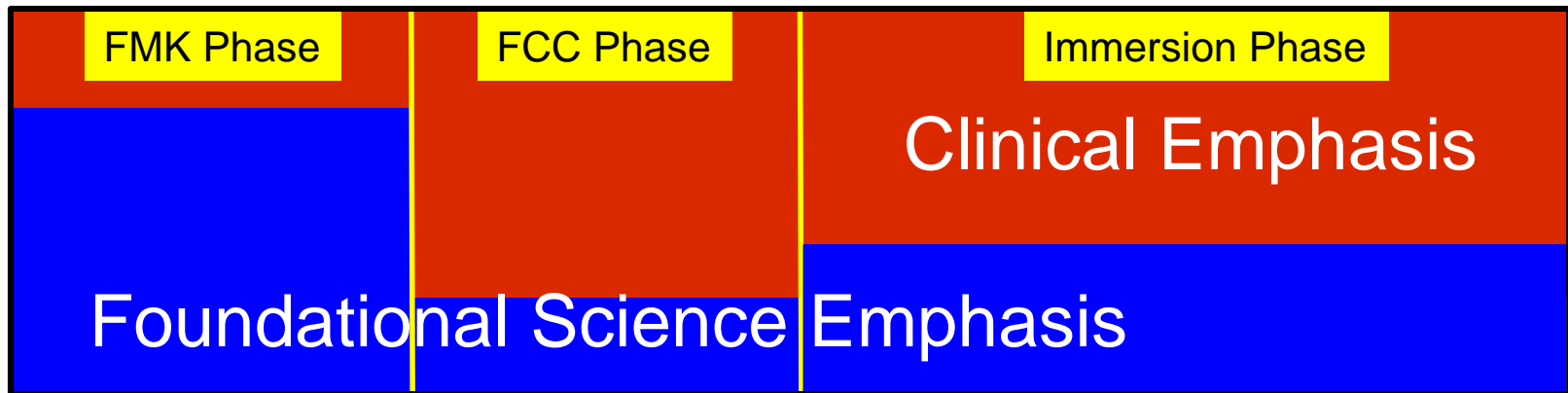
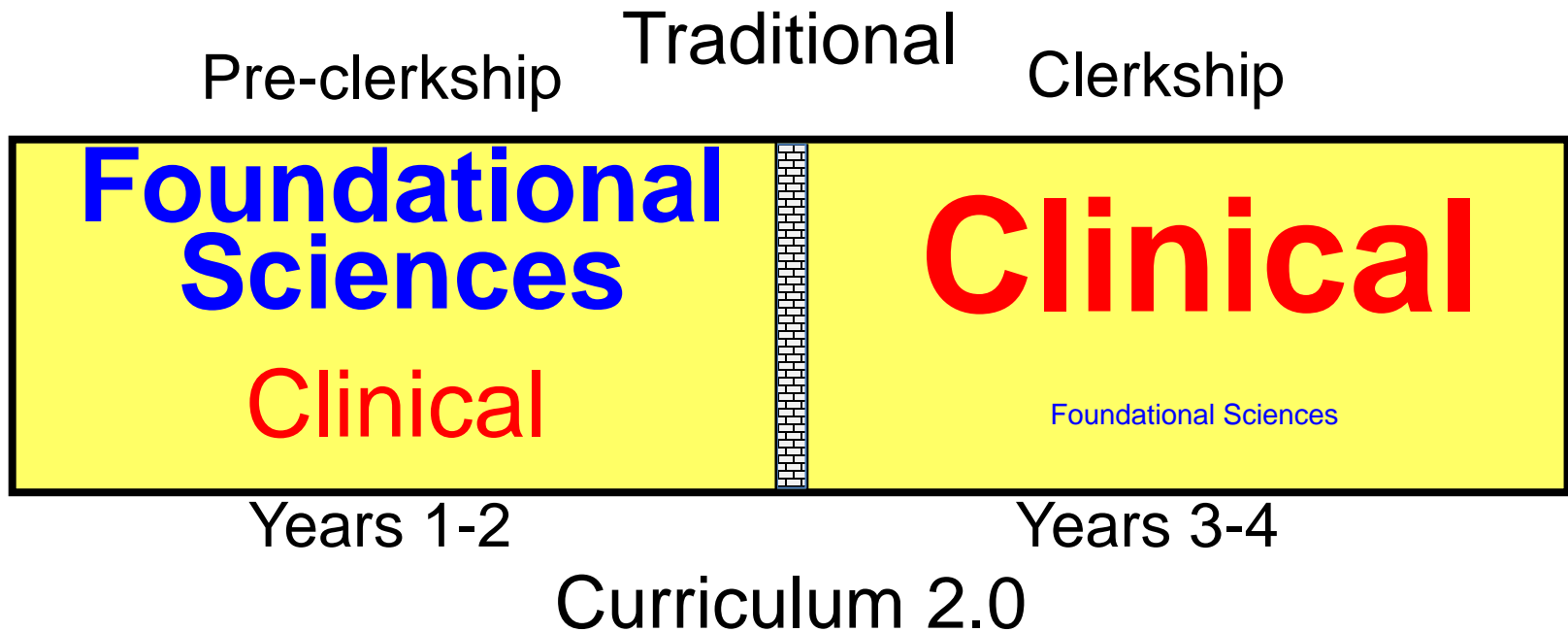
Kulamakan Kulasegaram, PhD, Julian C. Manzone, MSc, Cheryl Ku, MSc, Aimee Skye, PhD, Veronica Wadey, MD, and Nicole N. Woods, PhD

Acad. Med., 2015

“...results suggest that creating proximity between basic science and clinical concepts may not guarantee cognitive integration. Although cause-and-effect explanations may not be possible for all domains, making explicit and specific connections between domains will likely facilitate the benefits of integration for learners.”

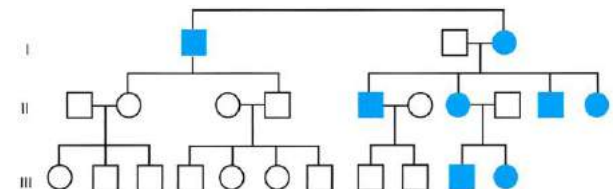
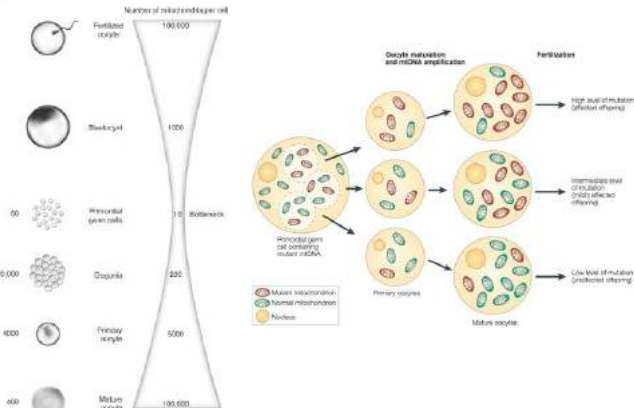
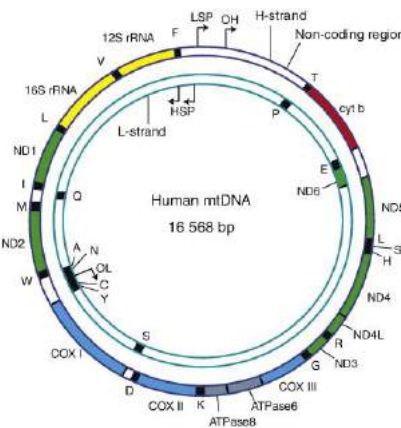
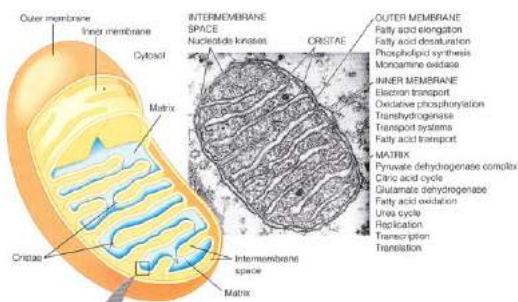
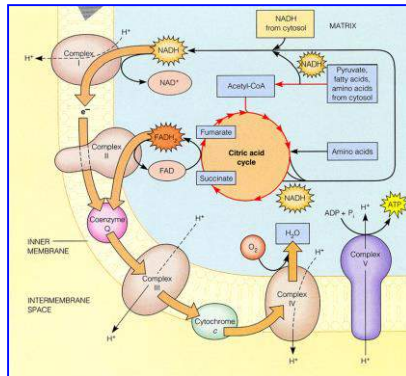
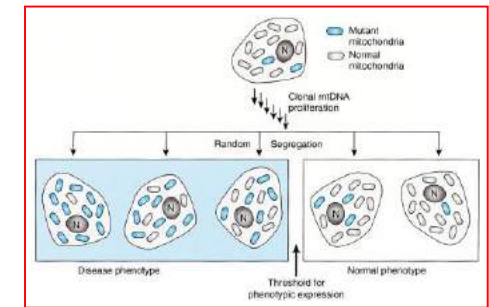
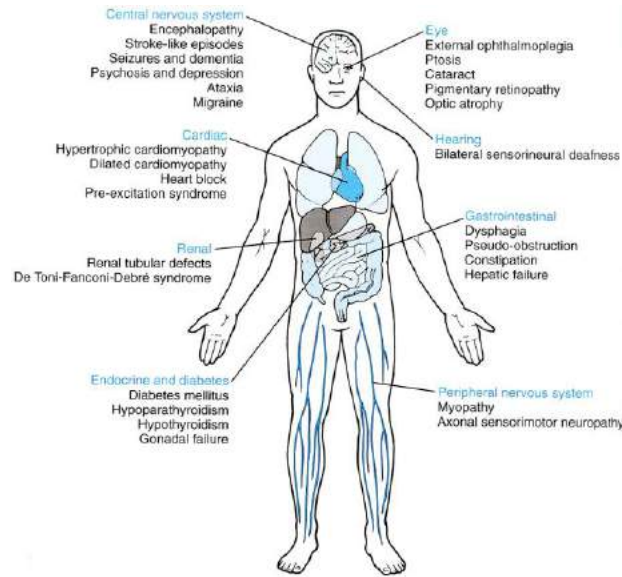
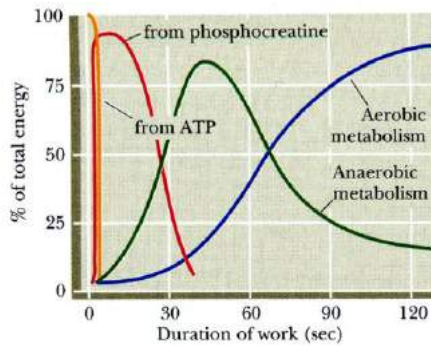
To achieve maximal impact, basic and clinical sciences need to be integrated on a “minute-by-minute” basis.

Traditional Curriculum vs. Curriculum 2.0



Teach foundational sciences across the medical school curriculum.
Teach foundational sciences in a context that prepares students for the clinical workplace.

Mitochondrial Disease



Use More Active Learning

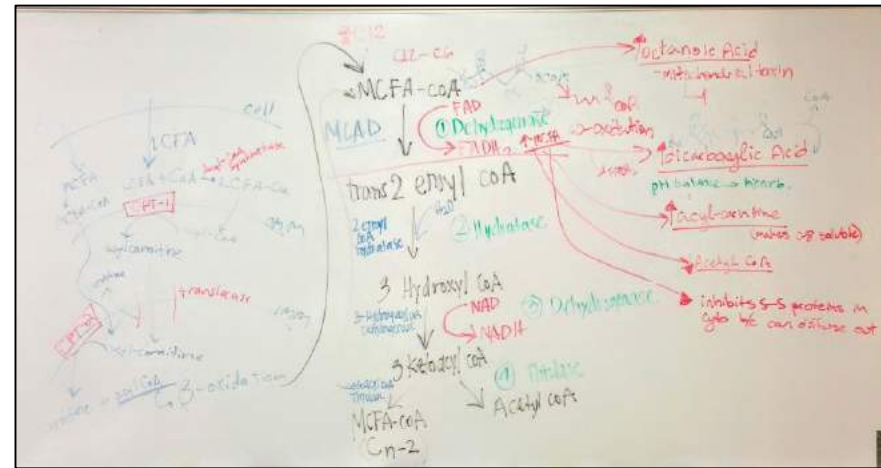
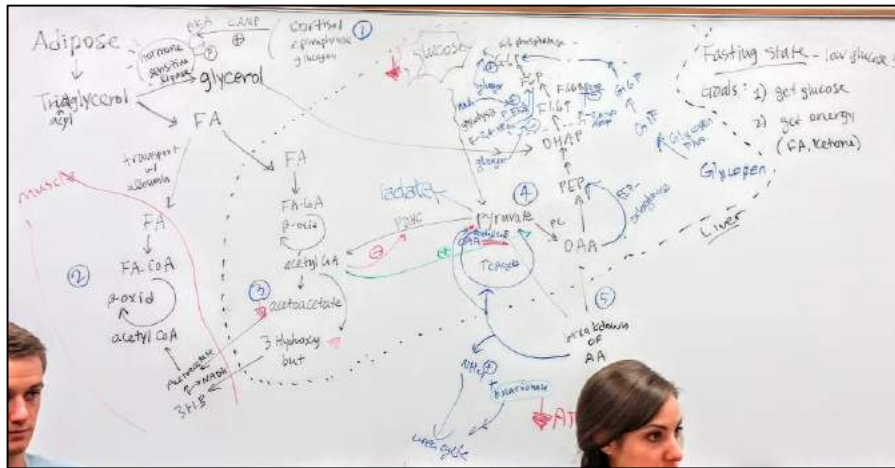


FMK Phase Weekly Schedule

	Monday	Tuesday	Wednesday	Thursday	Friday
8:00 AM- Noon	Case-Based Learning Groups	Large/Medium Group or Lab	Case-Based Learning Groups	Large/Medium Group or Lab	Case-Based Learning Groups
	Large/Medium Group or Lab		Large/Medium Group or Lab		Learning Community
1:00 PM - 5:00 PM	<div>Afternoons</div> <div>1 day per week in Continuity Clinical Experience 1 day per week in small groups for Physical Diagnosis At least 2 days per week protected time for study</div>				Large/Medium Group or Lab
					Physical Diagnosis

Case-Based Learning

- **Learner-centered, active learning format that simulates clinical practice in a safe setting**
- Scaffold “deep” medical science knowledge in a clinical context
- Begin to develop clinical reasoning skills
- Develop self-regulated learning skills
- Foster teamwork, communication, and leadership skills
- Foster intrinsic motivation to drive learning



CBL sessions help to ease the transition into the clinical phases.

Curriculum 2.0: Immersion Phase

A highly individualized post-clerkship phase
that uses clinical context to build upon prior learning

Advanced Clinical Experiences

rigorous clinical rotations

Integrated Science Courses

mixed didactic and clinical experiences

Acting Internships

supervised intern-level responsibilities

Research

mentored research project



IMMERSION PHASE GOALS

- Deepen **FOUNDATIONAL SCIENCE KNOWLEDGE** during meaningful clinical engagement
- Solidify **CLINICAL SKILLS**
- Enhance **PRACTICE-BASED LEARNING SKILLS**
- Ensure readiness for **INTERN ROLE/RESIDENCY**
- Expand knowledge and skills regarding **SCHOLARSHIP**
- Further grow knowledge and skills regarding **LEADERSHIP**
- Encourage **PROFESSIONAL DEVELOPMENT**



Common Features of ISCs

- **Primary goal: *deepen foundational science knowledge during meaningful clinical engagement*** (Foundational science learning is anchored and reinforced by the patient experience)
- Students spend ~50 hrs/wk in course-related activities (clinical and didactic).
 - Use **multiple modes of instruction**, with an emphasis on experiential/active learning.
 - **Active student involvement** in patient care and assigned clinical tasks.
- Each core course learning objective should include foundational science content.
- Assessment of foundational science knowledge in clinical context using both qualitative and quantitative assessment methods

Integrated Science Course (ISC) Menu

Cardiovascular Diseases
Critical Illness
Community Healthcare
Diabetes Mellitus
Emergency Care: Cell to System Science
Global Health
Getting Hooked: Immersion in Addiction
Healthy Aging and Quality Dying
Immunity and Infections in the Immune-Compromised Host
Infectious Diseases
Injury, Repair, and Rehabilitation
Medical Imaging and Anatomy
Precision Cancer Medicine
The Skinny on Obesity
Sexual Medicine and Reproductive Health
Working-Learning Health System



Precision Cancer Medicine

Modes of Instruction

- Personal Learning Goals
- “Meet the Expert” Seminars
- Online Modules
- Case-Based Learning
- Team-Based Learning
- Clinical Experiences
 - Patient Encounters
 - Tumor Board Meetings
 - Clinical Experience Essays
- “Burning Questions” Presentation

ISC Evaluations

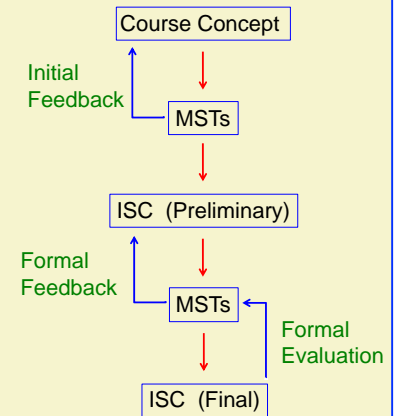
ISC (5 pt scale)

	A	B	C	D	E
Overall learning experience	4.91	4.81	4.86	4.80	4.75
ISC motivated me to continue learning in this area	4.82	4.67	4.57	4.90	4.75
ISC contributed to my professional development	4.91	4.78	4.86	4.80	4.75
Participation helped me learn relevant foundational sciences	4.73	4.61	4.43	4.90	4.56
I anticipate using the foundational science knowledge I acquired in this course in my future training and practice	4.82	4.83	4.43	4.90	4.75
I would recommend this course to my peers	4.91	4.67	4.86	4.90	4.81

Comments: Great experience learning practical knowledge... Fantastic integration of basic science with clinical medicine... Great balance of clinical and didactic learning... Good use of tying primary literature to clinical use... The best class I've taken in my life... Everything we did was relevant... You should take this course... Great course, run by great faculty...

Our Challenges

- Maintaining scientific rigor
 - Master Science Teacher (MST) review
- Faculty Participation/Effort
- Recruitment of Course Director Team
 - Basic Scientists and Clinicians
- Faculty Development – Curriculum Design, Assessment
- Course Capacity, Diversity between Courses
- Student Buy-In (Marketing)
- Assessment of Student Performance



Questions



For more on the pre-clerkship phase at Vanderbilt: Pettepher, Lomis, & Osheroff (2016) *Med. Sci. Educ.* **26**, 491. “From Theory to Practice: Utilizing Competency-Based Milestones to Assess Professional Growth and Development in the Foundational Science Blocks of a Pre-clerkship Medical School Curriculum.”

For more information on ISCs at Vanderbilt: K.B. Dahlman, *et al.* (2018) *Med. Sci. Educ.* **28**, 145-154. “Integrating Foundational Sciences in a Meaningful Clinical Context in the Post-Clerkship Curriculum.”