Role of Foundational Sciences in Clinical Years

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Disclosures

- Kim Dahlman receives salary support from VUSoM

Learning Objectives

- Describe the rationale for including foundational science content in clinical training
- Recognize educational strategies to achieve foundational science integration
- Identify challenges and solutions when integrating foundational sciences into clinical training

Agenda

1) Rationale for foundational science integration

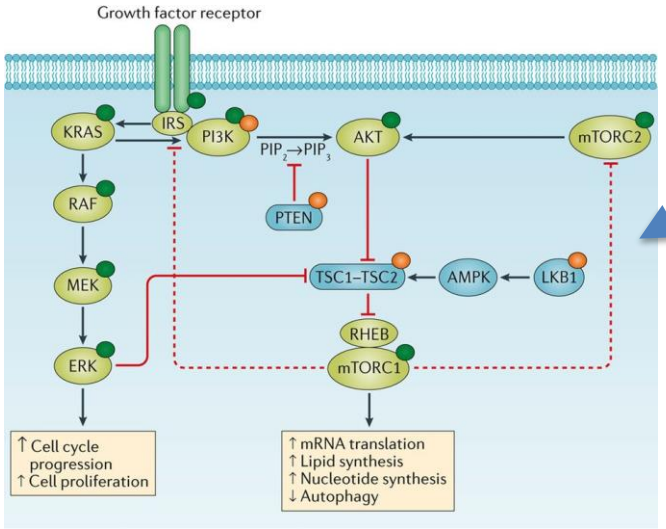
2) Vanderbilt Medical curriculum (C2.0)

3) Integrated Science Courses (ISCs)

4) Challenges and solutions

Image from proventainternational.com

Familiar Scenario?



TUMOR TYPE: BREAST INFLAMMATORY CARCINOMA

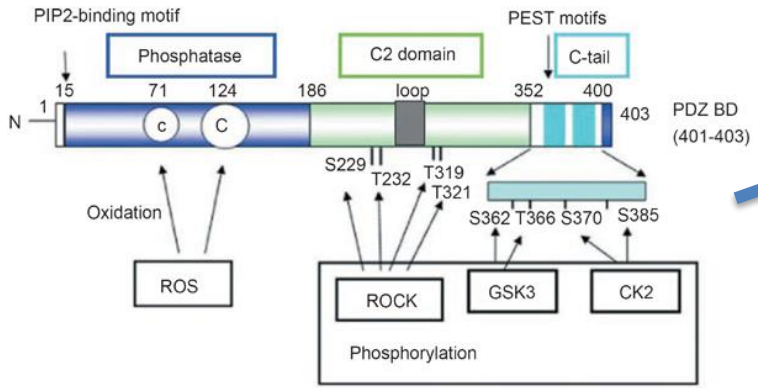
Genomic Alterations Identified†

EGFR V843I
PTEN loss exon 1

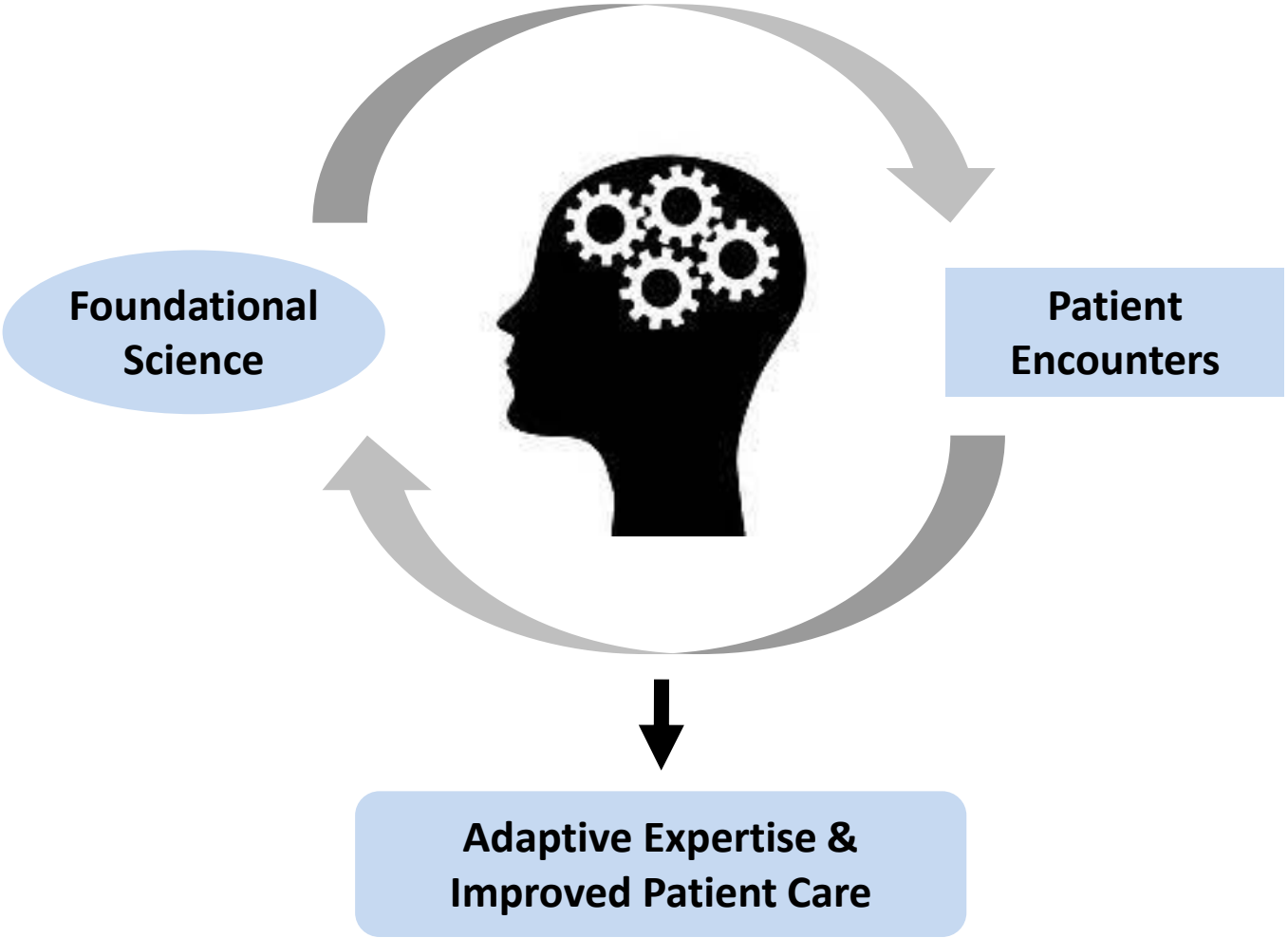
Additional Disease-relevant Genes with No Reportable Alterations Identified†

ERBB2

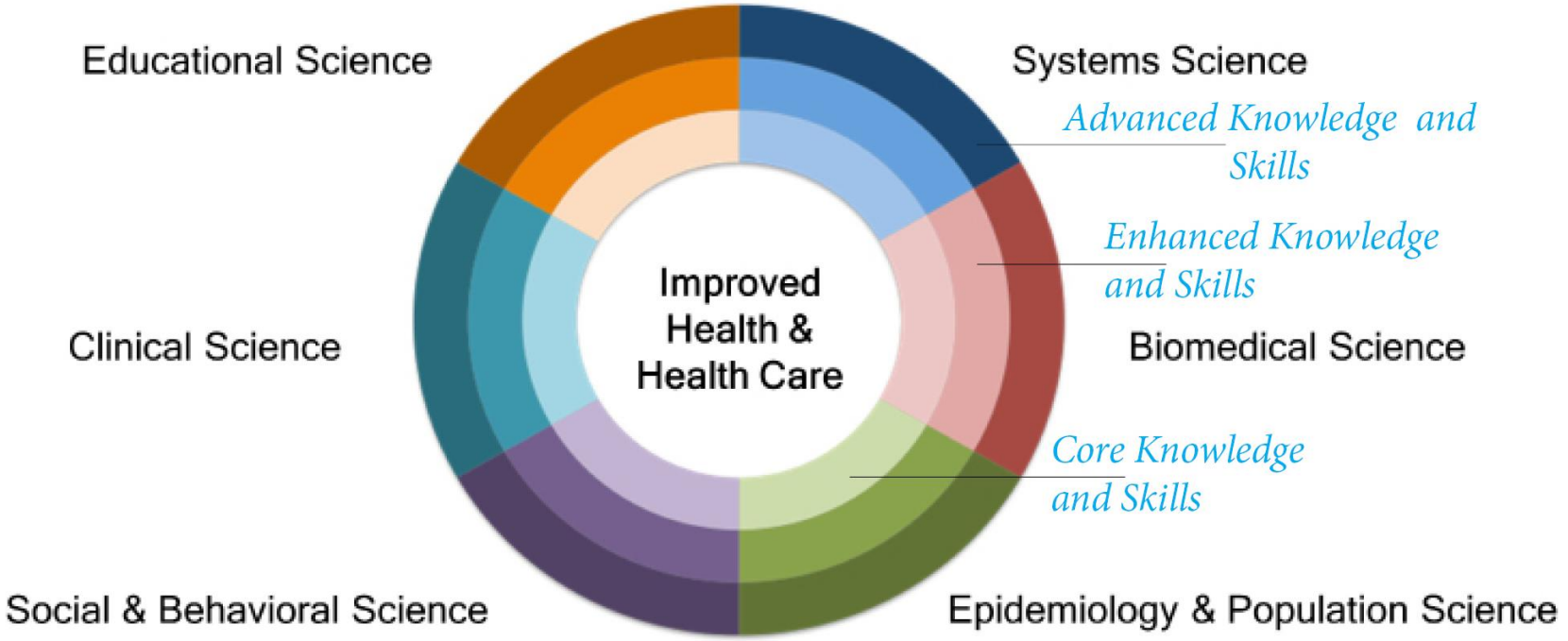
Nature Reviews | Clinical Oncology



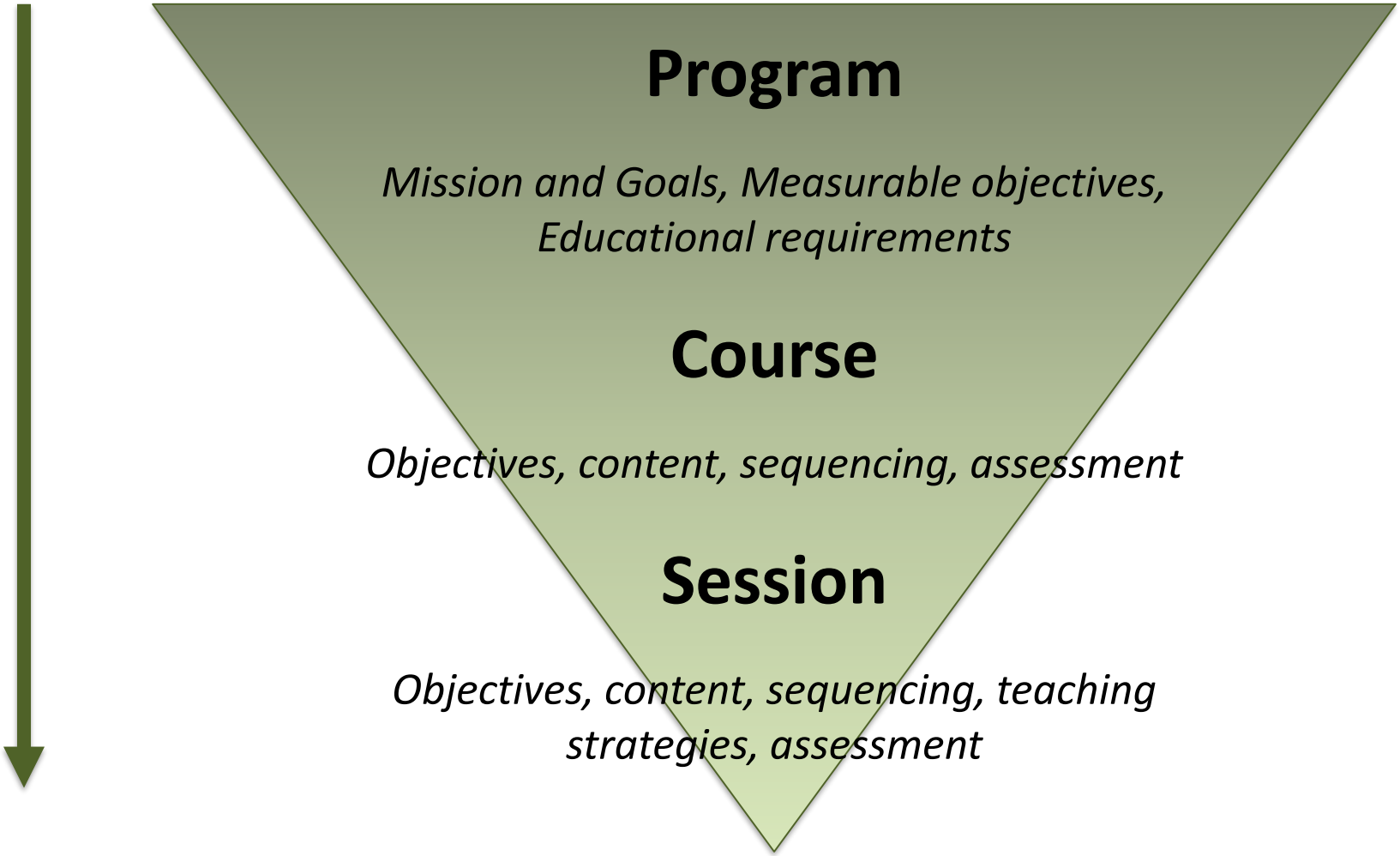
Why Integrate Foundational Science?



What is Foundational Science?



Framework for Curricular Integration



Goldman and Schroth (2012) *Acad Med*

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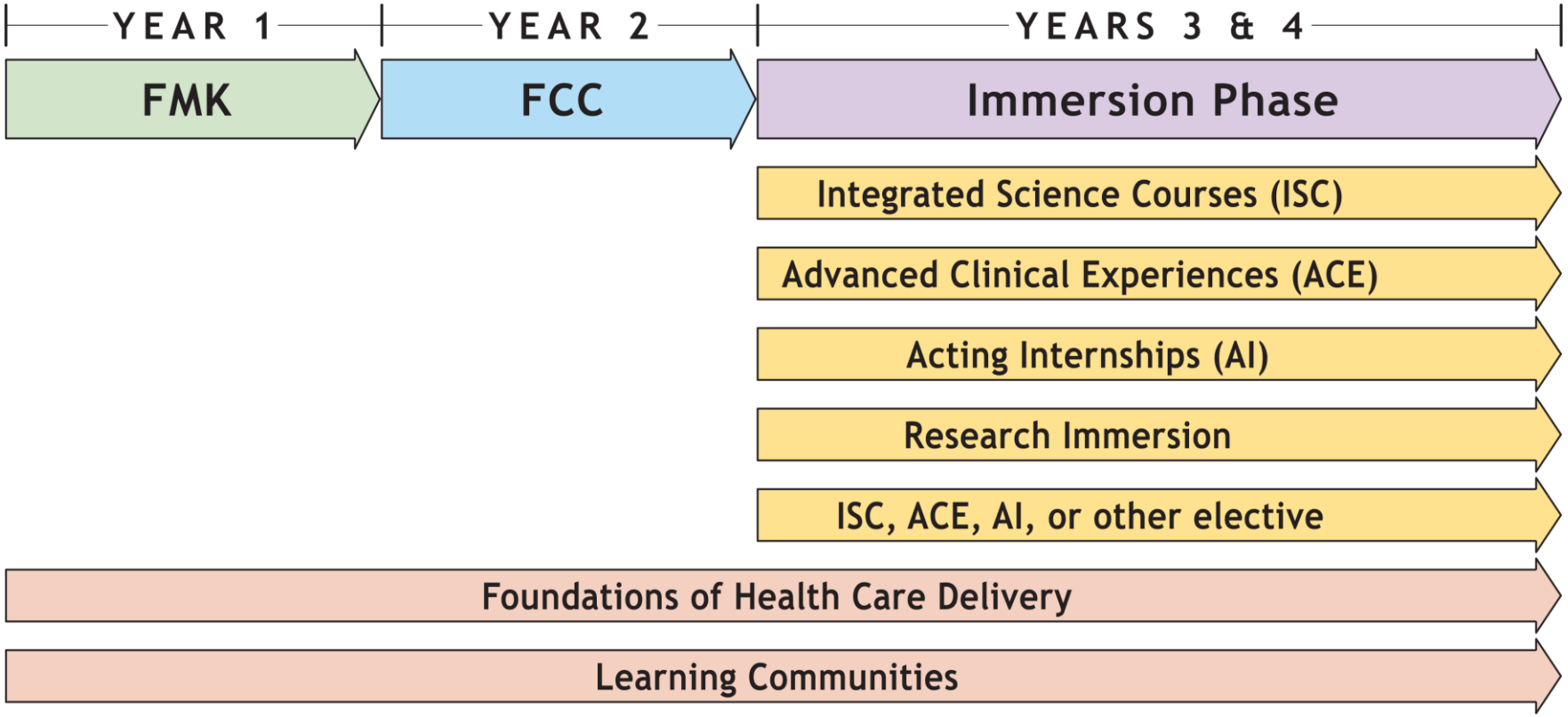
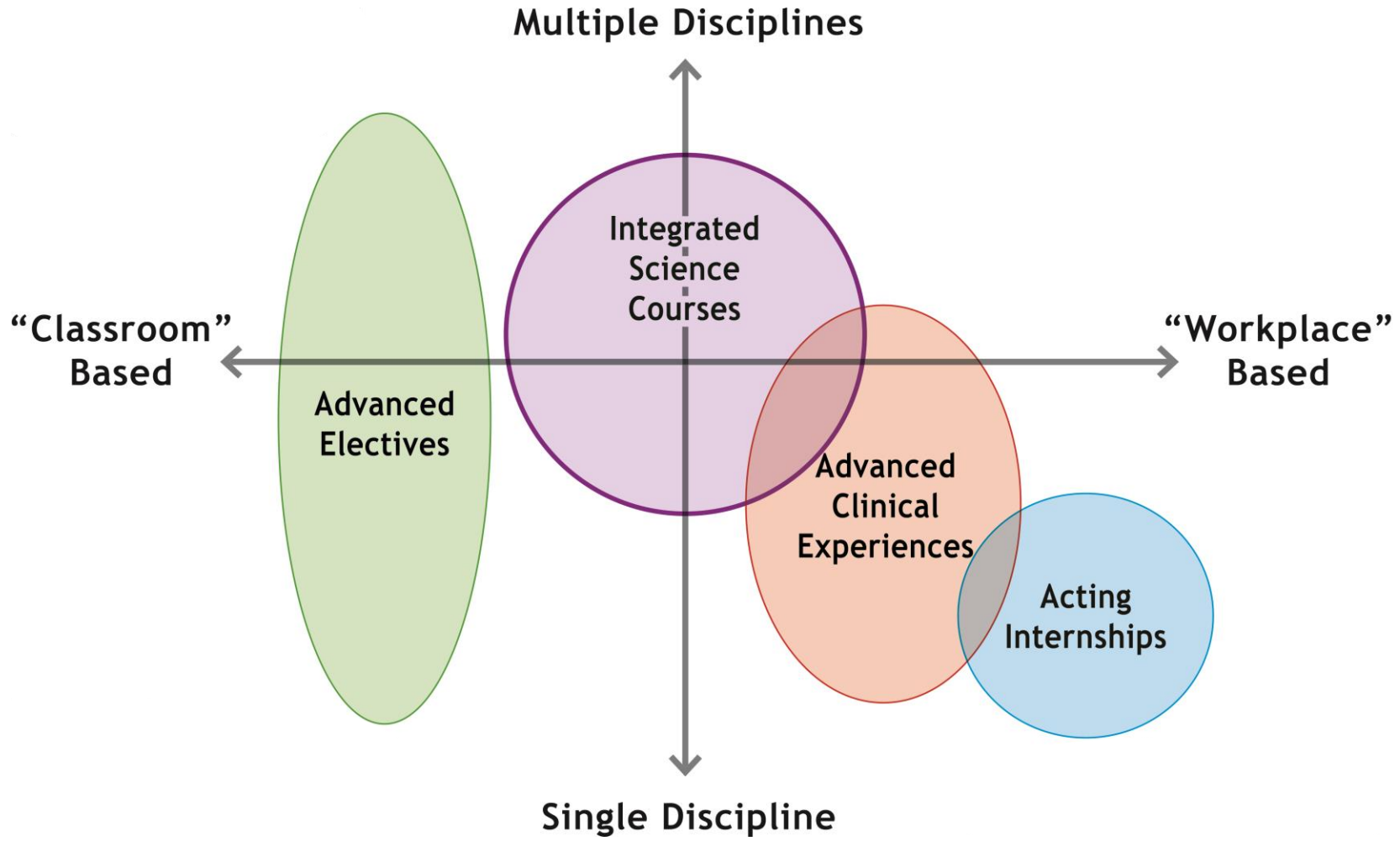
Vanderbilt Curriculum 2.0



Dahlman *et al.* (2018) *Medical Science Educator*. 28: 145-154

Immersion Phase Conceptual Framework



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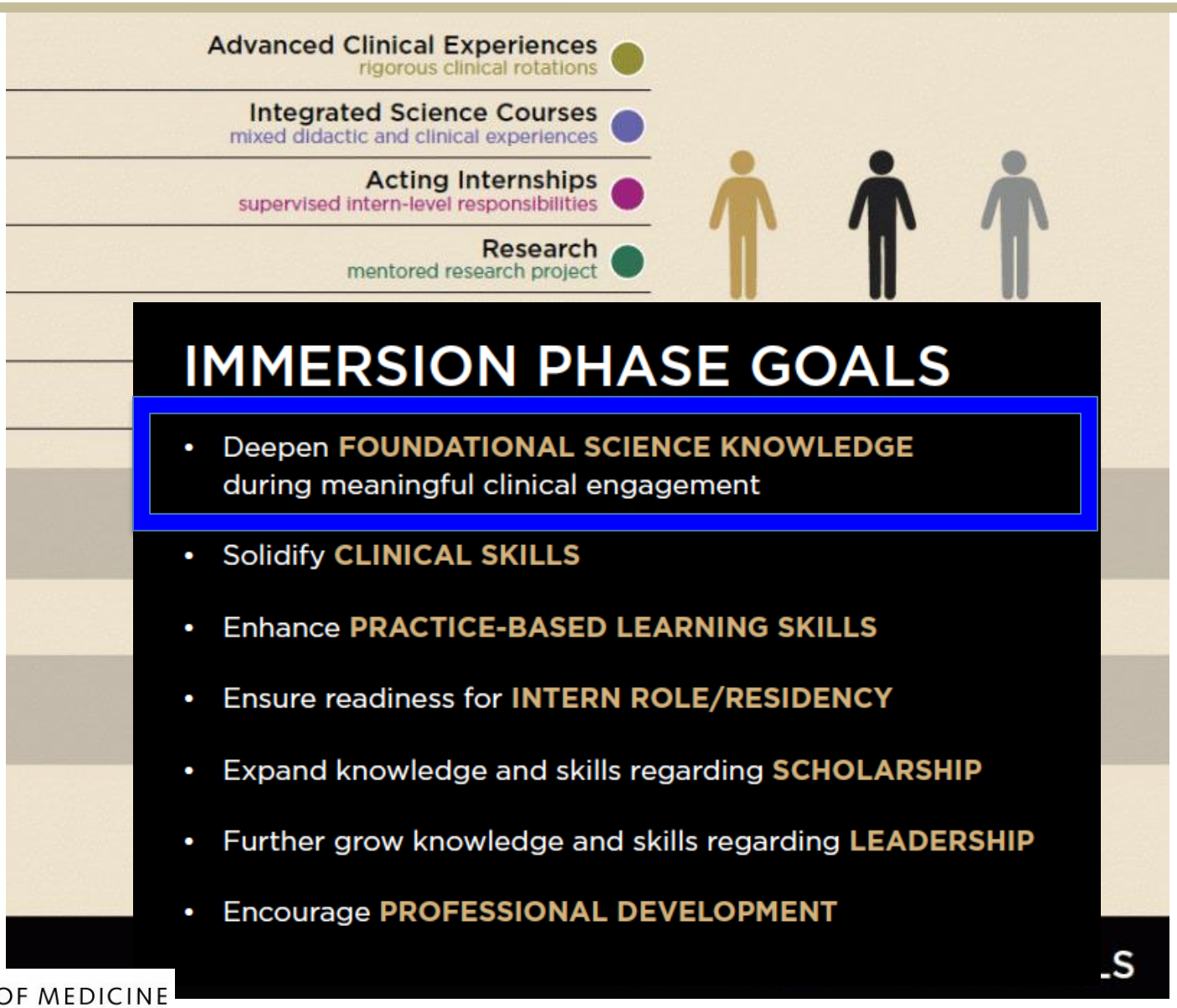
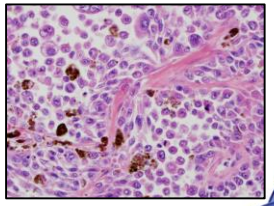
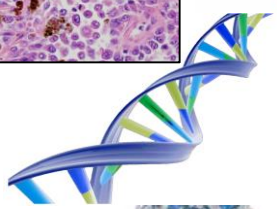
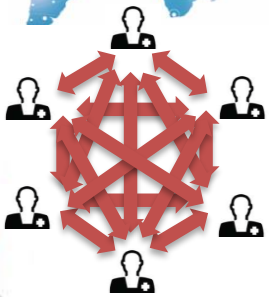
Immersion Phase goals

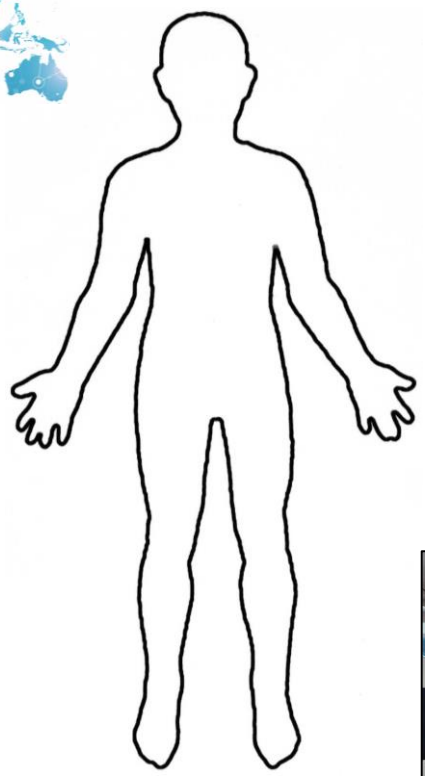


Common Features of Integrated Science Courses (ISCs)









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VANDERBILT UNIVERSITY

Images courtesy of Vanderbilt University or Vanderbilt University Medical Center

ISC Menu

1) Cardiovascular Diseases
2) Community Healthcare
3) Critical Illness
4) Diabetes Mellitus
5) Emergency Care: Cell to System Science
6) Global Health
7) Getting Hooked: Immersion in Addiction
8) Healthy Aging and Quality Dying
9) Immunity and Infections in the Immune-Compromised Host
10) Infectious Diseases
11) Injury, Repair, and Rehabilitation
12) Medical Imaging and Anatomy
13) Precision Cancer Medicine
14) The Skinny on Obesity
15) Sexual Medicine and Reproductive Health
16) Working-Learning Health System

Community Healthcare: Patients, Populations, and Systems

Goals:

- Equip students to address predictors of poor health on an individual level, particularly for vulnerable populations

- Engage healthcare systems to promote meaningful change-beyond identifying social determinants of health

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Slide courtesy of Saralyn Williams, MD. Photos courtesy of Tiffany Israel.

Community Healthcare: Patients, Populations, and Systems

Course directors:

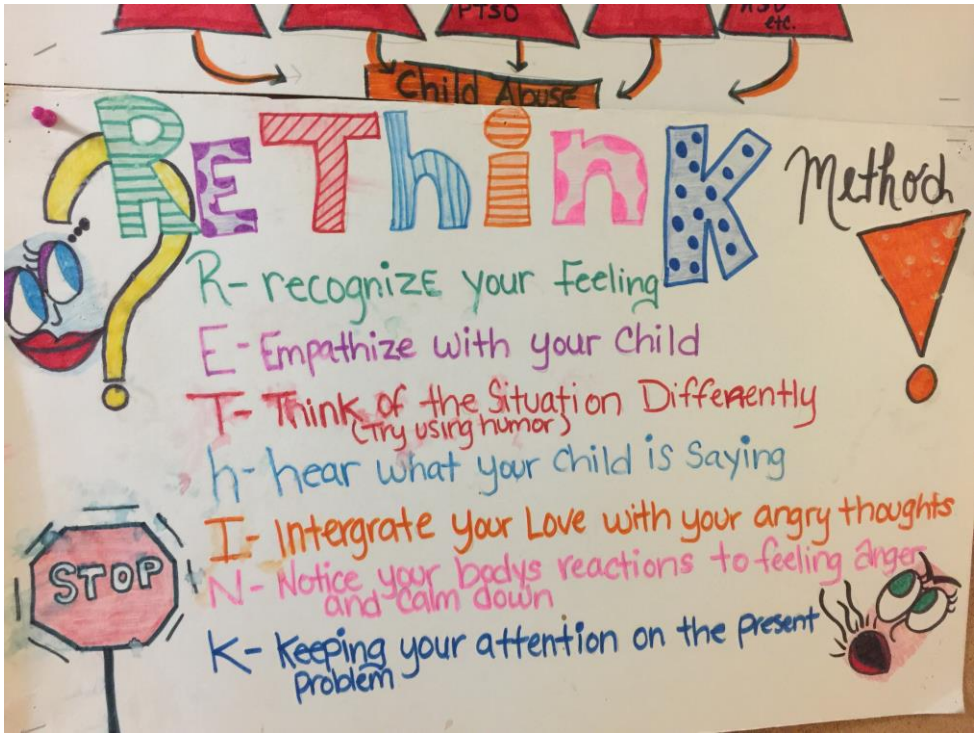
- MD: who partners with Federally Qualified Health Center to provide primary care to underserved population
- Social worker: 20 years of community advocacy work and manages a Community Engagement Studio for research

Slide courtesy of Saralyn Williams, MD. Photos courtesy of Tiffany Israel.

Community Healthcare: Patients, Populations, and Systems

Foundational sciences

- Population health
- Health ethics
- Behavioral science
- Communication science
- Stress biology
- Vaccine immunology



Slide courtesy of Saralyn Williams, MD. Photos courtesy of Tiffany Israel.

Community Healthcare: Patients, Populations, and Systems

- Lectures
- Community resource visits

Slide courtesy of Saralyn Williams, MD. Photos courtesy of Tiffany Israel.

Community Healthcare: Patients, Populations, and Systems

- **Experiential learning**
  - Reflections
  - “Photo voice” assignment-community based needs assessment of an assigned neighborhood, windshield survey, assets/challenges of neighborhood
  - Vaccine molecule to society model
  - Journal club

- **Community partner site**
  - Students participate in clinical care at a safety net primary care setting

Slide courtesy of Saralyn Williams, MD. Photos courtesy of Tiffany Israel.

Sample Schedule

	Monday	Tuesday	Wednesday	Thursday	Friday
Week 1	AM: Intro, Tours of missions, clinic visits and orientations PM: Longitudinal courses	AM: Lectures PM: Longitudinal courses	AM: clinic PM: clinic	AM: clinic PM: clinic	AM: Lectures PM: Reading/work block
Week 2	AM: Visitation day for community resources PM: Longitudinal courses	AM: Journal club Visiting speakers PM: Longitudinal courses	AM: clinic PM: clinic	AM: clinic PM: clinic	AM: Health policy speakers PM: Photo voice presentations

Slide courtesy of Saralyn Williams, MD

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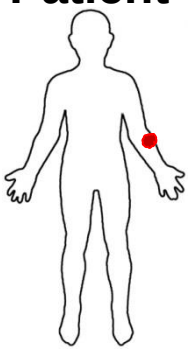
https://medschool.vanderbilt.edu/ume/integrated-science-courses

Precision Cancer Medicine ISC Goals

- Describe underlying foundational science driving tumorigenesis
- Explore how foundational science knowledge is leveraged in the clinic to treat cancer patients
- Examine how multidisciplinary teams work together in the care of cancer patients
- Pursue own interests in oncology and achieve personal learning goals

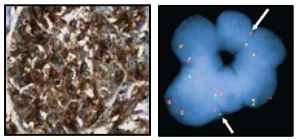
Foundational Science



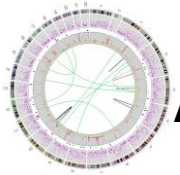
Mechanisms of drug :

- Response
- Resistance
- Side effects

- Epidemiology
- Staging and grading
- Genetic screening/alterations
- Oncogene addiction
- Cell signaling
- Kinase activity
- Host-tumor interactions
- Tumor heterogeneity
- Tumor evolution
- Molecular diagnostics



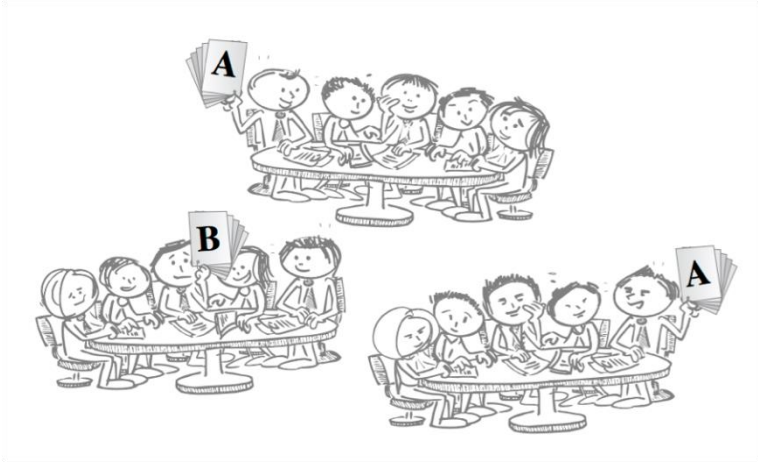
- Biomarkers
- Clinical trial design
- Pre-clinical drug development
- Mechanism of drug action



Active Learning Activities Emphasized

- **Classroom**
  - "Meet the Expert" seminars
  - Online Modules
  - Case-based learning
  - Team-based learning

- **Self-Directed**
  - Personal learning goals
  - "Burning Question" presentation
  - "MythBusters" presentation
  - Primary literature reading



learntbl.ca/what-is-tbl/

Clinical Experiences

- **Patient Interactions**
  - 16 half days in medical, pediatric, radiation, or surgical oncology (longitudinal)
  - 2 half days in hereditary cancer, pathology, interventional radiology, interventional pulmonology, or cardio-oncology

- **Tumor Board Meetings**

- **Clinical experience essays**

Week 1 Schedule

	Monday	Tuesday	Wednesday	Thursday	Friday
7:30 AM-12 PM	Course Introduction	**Medical Oncology Clinic**	**Melanoma Tumor Board**	**Medical Oncology Clinic**	Self-Directed Learning
	"Meet the Expert" Seminar: *Cancer Epidemiology*		Case-Based Learning Activity 1		
	Self-Directed Learning		Online Module 1-3 Review		
1 PM-5 PM			**Interventional Radiology Clinic**	**Medical Oncology Clinic**	Team Based Learning Activity 1: Oncogene Addiction
					"Meet the Expert" Seminar: *Inherited Cancer Susceptibility*

ISC Evaluation Outcomes (AY 15-17)

	# of student responses					Mean (95% CI)
	Strongly Disagree (1)	Disagree (2)	Neither Agree nor Disagree (3)	Agree (4)	Strongly Agree (5)	
Foundational science learning was embedded in the clinical experiences	0	3	11	92	115	4.44 (4.35-4.53)
Foundational science learning informed and enriched the clinical experiences	0	6	14	79	122	4.43 (4.33-4.53)
Clinical relevance was provided during non-clinical foundational science learning activities	0	1	13	79	128	4.51 (4.43-4.59)
Clinical experiences informed and enriched the foundational science learning	0	2	10	83	126	4.51 (4.43-4.59)

- "Fantastic integration of basic science with clinical medicine"
- "Great balance of clinical and didactic learning"
- "Good use of tying primary literature to clinical use"
- "This was hands down the best class I've taken in my life...Everything we did was relevant"

Dahlman *et al.* (2018) *Medical Science Educator*. 28: 145-154

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Image from proventainternational.com

Challenges and Solutions

- **Student buy-in**
- **Maintaining scientific rigor**
- **Course diversity**
- **Long-term sustainability**

Graphic from www.telegraph.co.uk/men/active/how-to-train-for-an-obstacle-course-race/

Learning Objectives

- Describe the rationale for including foundational science content in clinical training
- Recognize educational strategies to achieve foundational science integration
- Identify challenges and solutions when integrating foundational sciences into clinical training

Acknowledgements

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Co-Directors, Immersion Phase

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Program Manager,
Immersion Phase

LaToya Ford
Program Coordinator,
Immersion Phase

AMA
AMERICAN MEDICAL ASSOCIATION

Accelerating Change in
Medical Education Initiative

- Neil Osheroff, PhD (FMK Phase Director)
- Kim Lomis, MD (Associate Dean for UME*)
- Matt Weinger, MD (Co-leader, ISCs*)
- ISC Faculty and students

References

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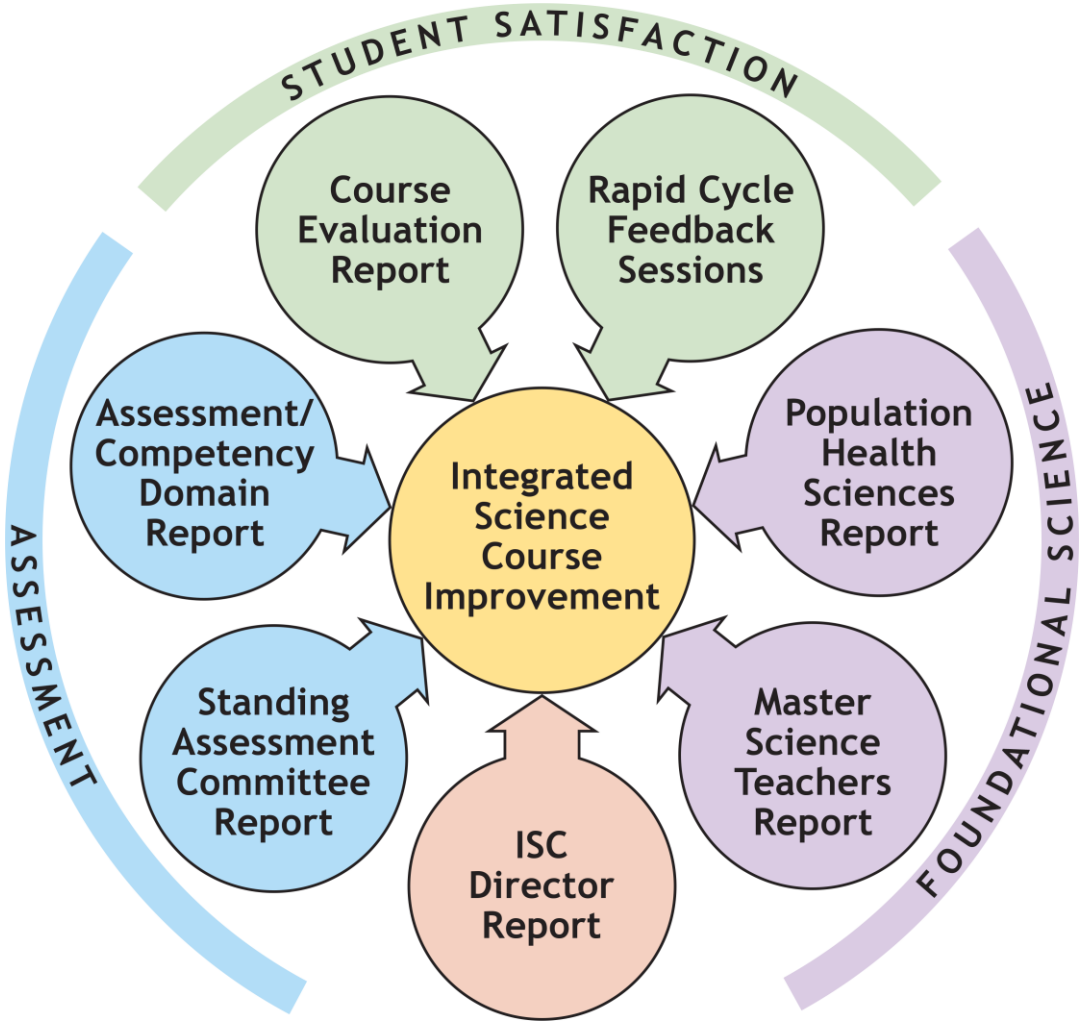
Quality Improvement Process



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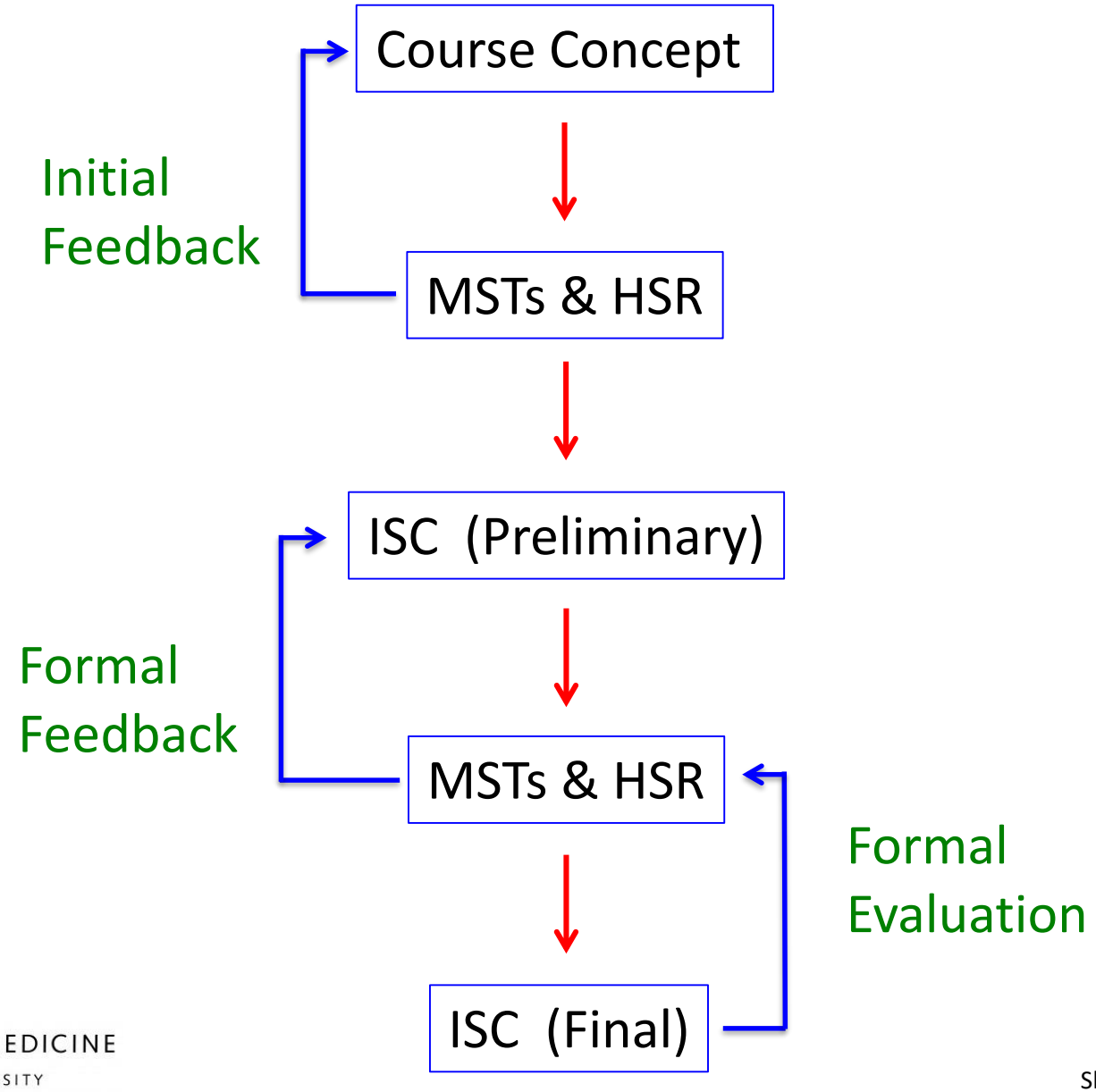
Using MSTs/HSR to Promote Scientific Rigor



Slide courtesy of Neil Osheroff

ISC Final Grade Rubric

Final Grade	Quantitative Score	Summative Competency Ratings (Qualitative Score)*
Risk of Failure (course director discretion)	<70%	Any Sub-Threshold OR >2 Thresholds
Pass	At least 70%	No more than 2 Thresholds All others at Target or above
High Pass	At least 80%	At least 3 Reaches All others at Target
Honors	At least 90%	Nothing below Target 5 Reaches

*For a description of "Threshold", "Target", and "Reach" for each competency/milestone, please visit https://medschool.vanderbilt.edu/ume/isc-milestones-students

ISC Assessment Best Practices

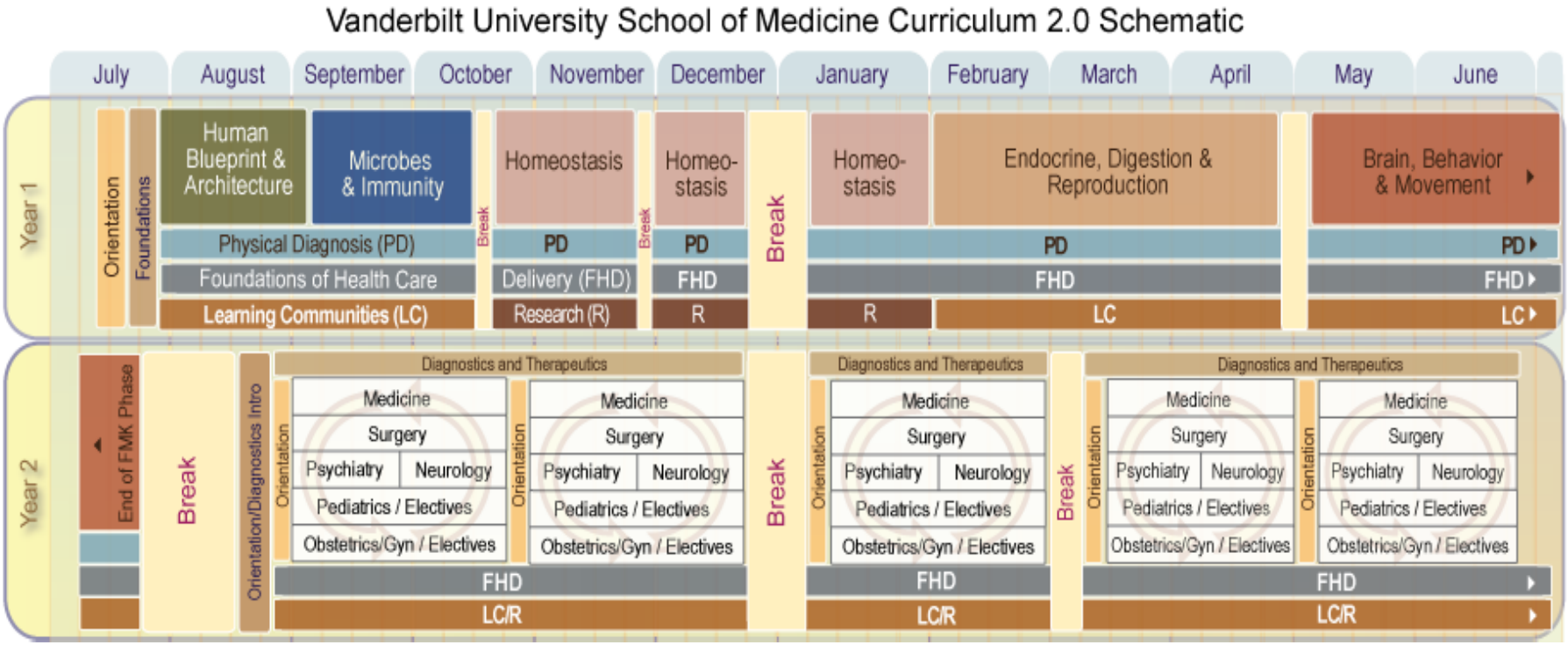
- **Valid** and **Defendable**
  - The grade accurately reflects student's performance
  - There are enough data to justify the grade

- **Transparent**
  - Students know how they're being assessed for each activity
  - Course directors are clear about how weighing assessments to determine final grade
  - Students can access their assessment data during and after the course

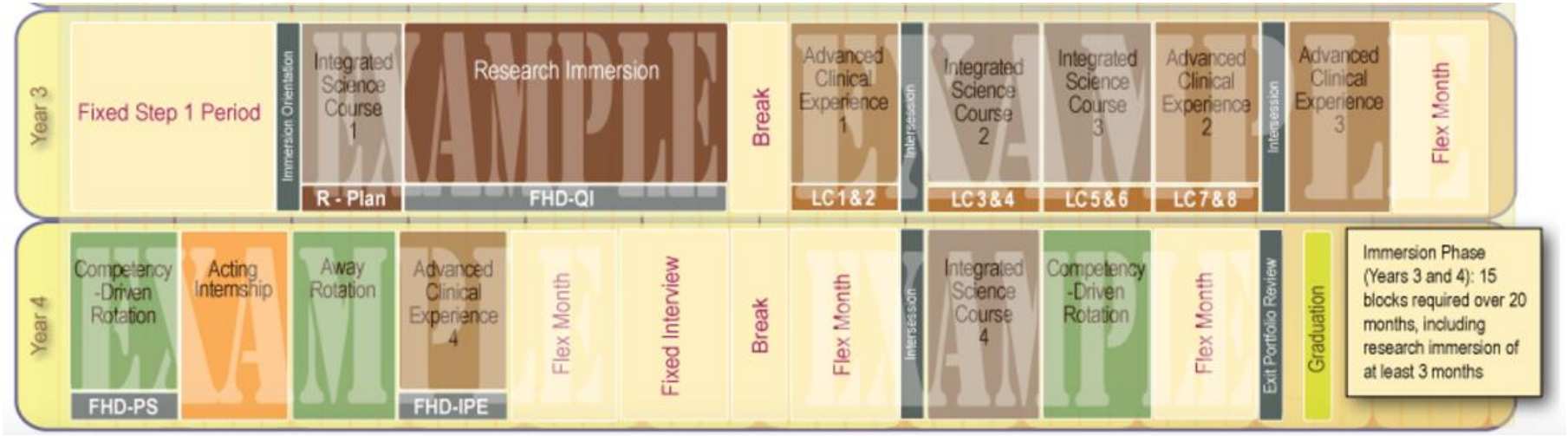
- **Documented** and **Auditable**
  - Quantitative assessments and changes (i.e., grade "curving") are captured
  - Changes to qualitative assessments (i.e., weighting peer vs. faculty) are documented
  - Documentation supports the final grade

- **Consistent across courses**
  - Students receive similar treatment across courses

Student Example Schedule: Years 1&2



Student Example Schedule: Years 3&4



- 1-month long rotations
- Total of 20 months: 15 months required (+2 for STEP1)
- Minimum of 4 ISCs
- 3-6 month mentored research experience
- Longitudinal curricular elements (Foundations of Healthcare Delivery and Learning Communities) remain integral

Foundational science clinical applications

Clinical Management and/or Skills	Foundational Science
Performing focused H&P for hand injury	Anatomy & histology of hand muscles
Insertion and management of central line	Epidemiology of CLABSI & science of hand washing
Management of acute chest pain	Cellular mechanisms of cardiac ischemia
Treatment regimens for breast cancer	Pharmacogenomics of treatments
Managing side effects of acute opioid pain treatment	Neural mechanisms of opioid tolerance and dependence
Obtaining consent for surgery in child of Jehovah's Witness parent	Fundamentals of ethics, negotiation & conflict resolution
Helping homeless diabetic patient deal with psychosocial issues	Evidence for policies promoting homelessness and health disparities