

Integrating Health Systems Science Education into a Medical School Curriculum: Challenges, Facilitators, and Strategies

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Objectives

Upon completion of this session, participants will be able to:

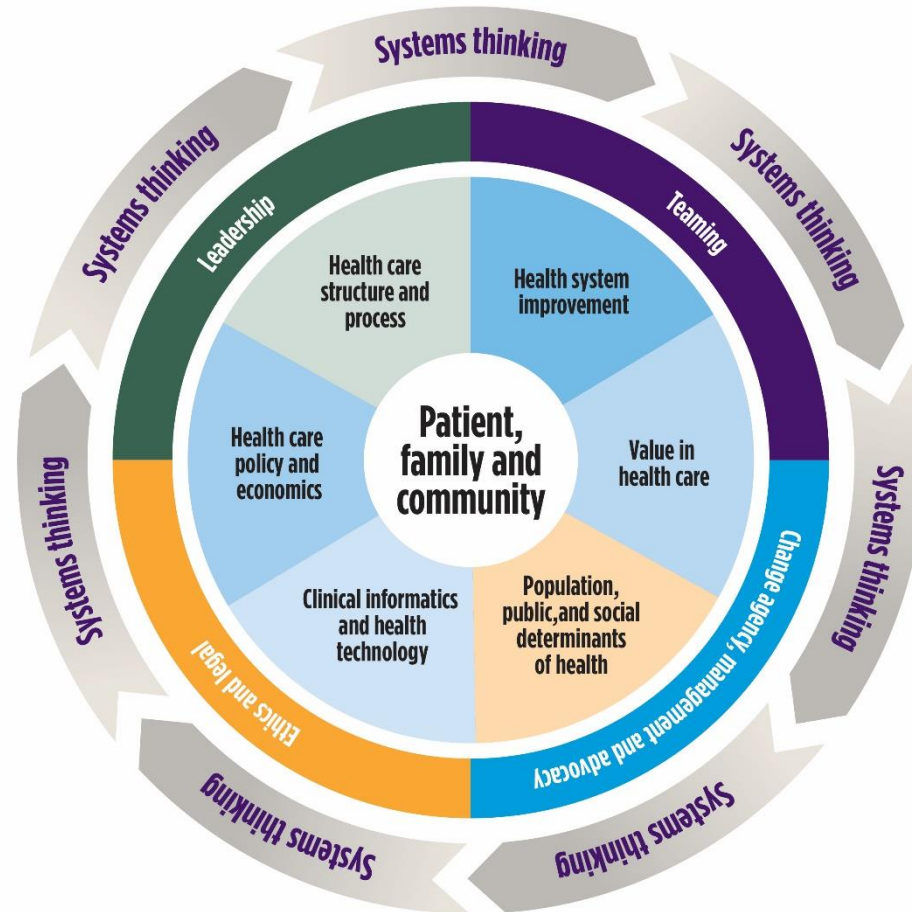
1. Identify the key challenges involved with integrating Health Systems Science education into a medical school curricula,
2. Articulate the concept of the “implementation dip” in curricular innovations,
3. Describe the Health Systems Science areas within accreditation standards, the graduation questionnaire, and board examination blueprints,
4. Articulate the issues that need to be considered in a systematic strategy for implementing Health Systems Science in medical education.



Language



The HSS Framework [12 domains]



The Comprehensive HSS Framework

Schema Crosswalk of Health Systems Science Learning Areas With Systems-Related Competencies, Accreditation Items, Curricula and Textbooks.

Health Systems Science Core Domains	Patient Experience and Context		Healthcare Delivery		Policy and Economics		Clinical Informatics and Health Technology			Population and Public Health			High-Value Care			Health System Improvement			Systems Thinking	Change Management	Ethics and Law	Leadership	Teamwork
	Patient Experience	Behaviors	Structures	Processes	Policy	Economics	Informatics	Decision Support	Technology	Social Determinants	Public Health	Pop Health Improvement	Quality	Cost	Evaluation	Quality Improvement	Data and Measurement	Innovation and Scholarship					
UME – Competencies and Accreditation																							
AAMC Core EPAs for Entering Residency	•		•	••			•		•	•			•	•		••						••	
Competency Domains, Health Professions IPE/collaboration competencies	•		•	•			•		•	•			•	•		•		•		•	•	••	
IHI Knowledge Domains for Improvement		•	•	•						•							•	•			•	•	
AAMC QI/PS competencies ⁶⁶		•	•				•			••		••	••	••		••	••				•	••	
AAMC Graduation Questionnaire (98-04)	•	•	•	•		•		•	••	•		•	•	•						•	•	•	
AAMC Graduation Questionnaire (05-09)	•	•	•	•	•	•	•	•	••	•		•	•	•		•				•	•	•	
AAMC Graduation Questionnaire (10-17)	•	•	•	•	•	•	•	•	••	•		•	•	•		•				•	•	••	
LCME Data Collection Inventory	•	••				•	•	•		••		•	•									••	
USMLE Physician Tasks/Competencies						•	•						•			•				•	•	•	
USMLE Content Outline			•	•	•	•	•	•		•	•	•	••	•		••	•			•	•	••	
GME – Competencies and Accreditation																							
ACGME SBP Competency Domain			••	••								•	••	•		•				•	•	••	
ACGME harmonized milestones	••		•	•	•	•			•	••			•	•		•		•		•	•	••	
ACGME Common Program Requirements		••		••								••	••			••			•	•	•	••	
ACGME CLER Pathways to Excellence			•	••								•	••			••	•					•	
National and Local Curricula																							
IHI Open School Curriculum	••		•	•					•	••	•	•	••	••	•	••	••	••	•	•	••	••	
ACP High Value Care Curriculum	•					•							••	••	••	••						•	
Quality and Safety Educators Academy				•									••	••		••				•		•	
Harvard Med Social Medicine course		•			•	•						••	••								•	•	
East Carolina Fac Development Program			•									•	•		••	•				•	•	••	
Mayo Clinic Alix SOM Science of HCD	••	••	•	•	•	••	••	•	•	•		••	••	••	••	•			•	•	•	••	
Recommendations/Calls for Curricula																							
UME policy curricula			•	•	••	••			•	•	•	•	•		•						•	•	
Prevention/Pop Health Framework	•		•	•	••	••		•	•	••	••	••	•	•						•	•	•	
Pop Health Curricular Framework			•	•	•	•		•	•	•	•	••	••				•				•	•	
UME-21 - Education collaborative			•	•			•	•		•	•	•	•								•	•	
Textbooks																							
Pop Health: Creating Culture Wellness	•	••	•	••	•	•		••	•	••	••	••	•			•				•	•	•	
Understanding Patient Safety		•	•	••			••	•	•	•		•	••		•	••				•	•	•	
Understanding Value-Based Care		•	•	•	•	••		•	•	•		•	••	••		•				•	•	•	
Health Systems Science	•	•	••	••	••	••	••	••	••	••	••	••	••	••	•	••	••	•	••	•	•	••	

The "•" and "••" designations represent degree of focus dedicated to area (•=minor focus, ••=moderate/ high focus).

Why does a comprehensive HSS framework matter?

1. Ensures core competencies are not marginalized (e.g. HSS \neq QI)
2. Accounts for related competencies in curricular design
3. Establishes a foundation for comprehensive pedagogies
4. Provides a clear learning pathway for UME \rightarrow GME \rightarrow workforce
5. Facilitates a shift towards a national standard
6. Catalyzes the new healthcare professionalism of systems citizens.

Student Perceptions and Evaluations



Gonzalo et al. AMA Change Med Ed Case Library 2018

Gonzalo et al. Concerns and Recommendations for Integrating Health Systems Science into Medical Student Education. Acad Med 2017

Gonzalo JD, et al. Exploring challenges in implementing a health systems science curriculum. Medical Education 2015

Mills et al. Integrating HSS in early undergraduate medical education: barriers to implementation and lessons learned. MEDed Publish 2018

Conn et al. Uncovering Cultural Barriers to QI Learning in a Trauma Program: An Ethnographic Study. Journal Surgical Education 2018

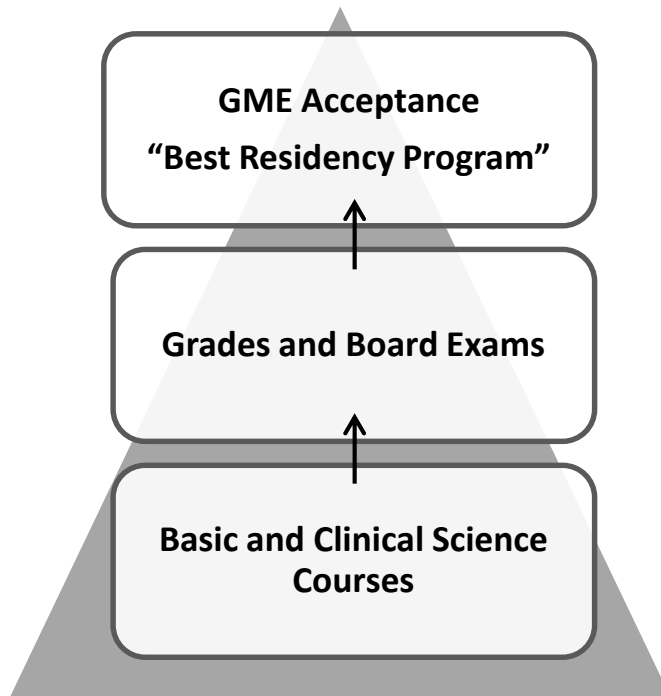
Gonzalo, Ogrinc. Health Systems Science: The “Broccoli” of Undergraduate Medical Student Education. Acad Med 2019



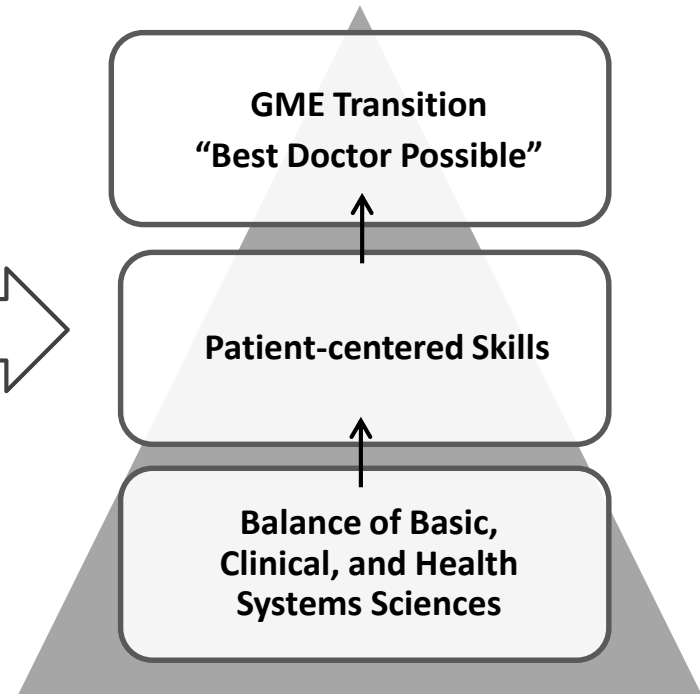
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The Pedagogical Challenge

Current Medical Student Priorities



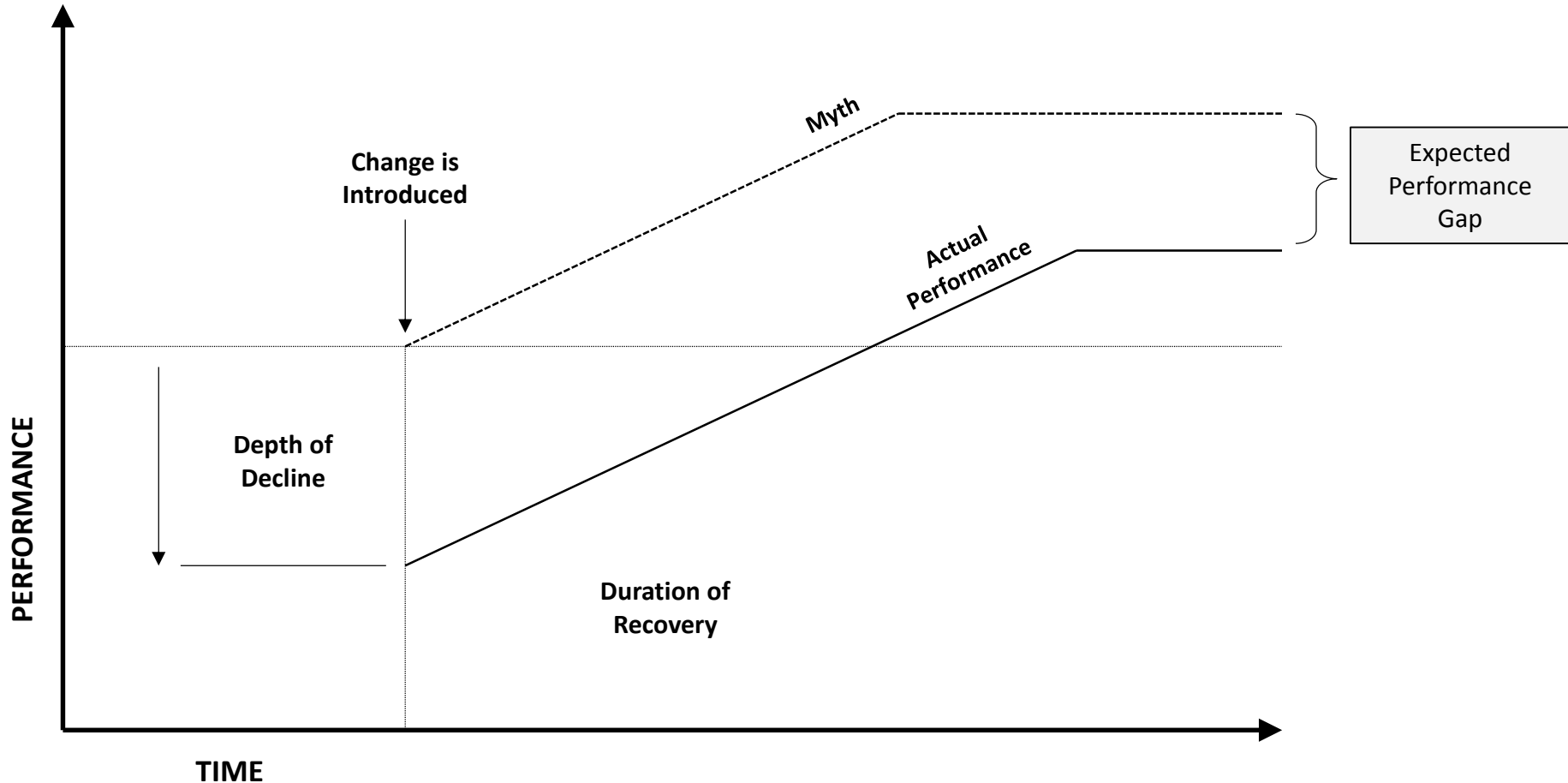
Alternative Medical Student Priorities



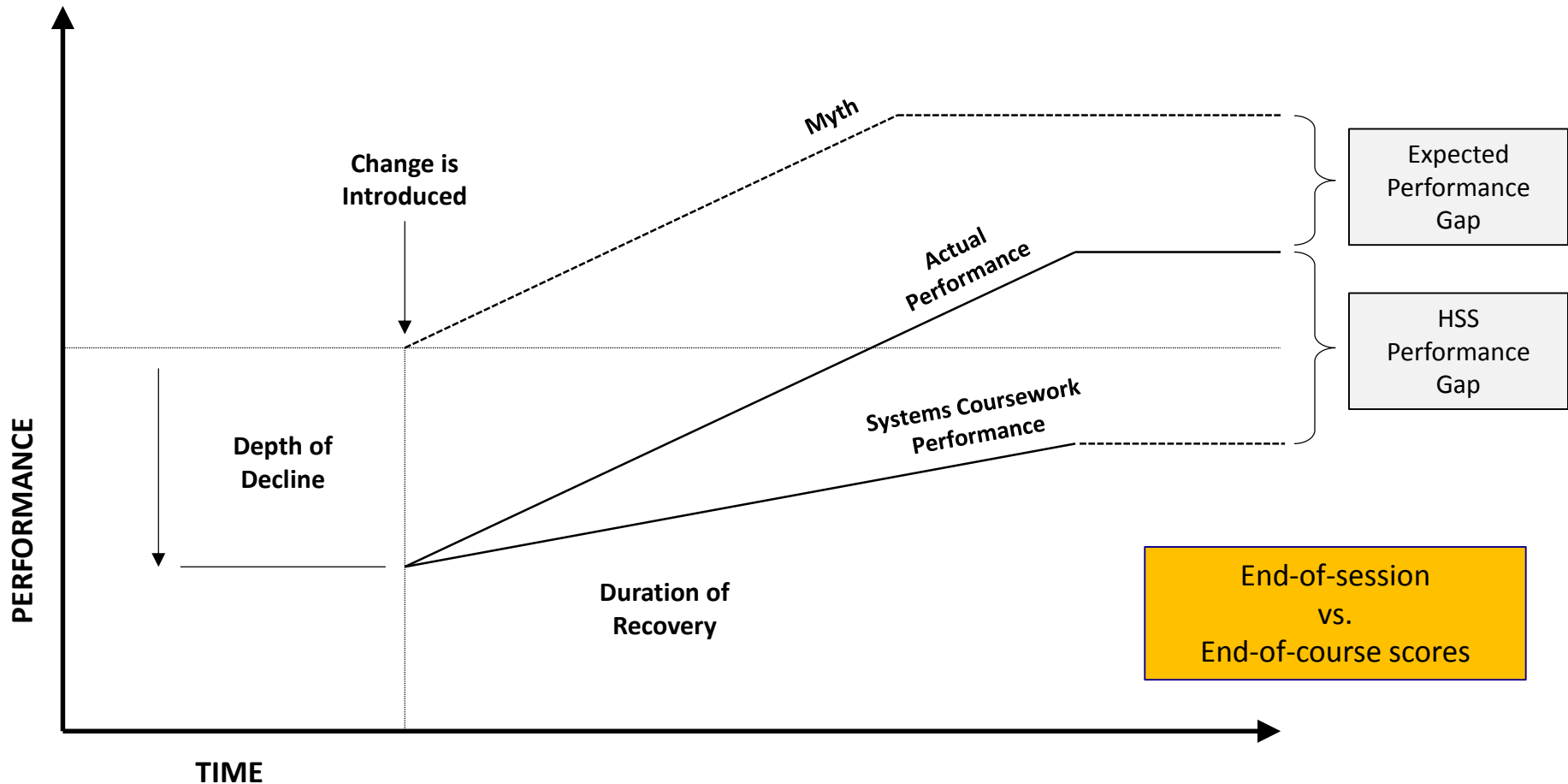
At Odds



Implementation Dip



Implementation Dip



Eastwood KW LK. Restructuring that lasts: managing the performance dip. Journal of School Leadership 1992

Bland CJ, et al. Curricular change in medical schools: how to succeed. Acad. Med 2000

Herold DM, Fedor DB. Change the way you lead change : leadership strategies that really work. Stanford Business Books 2008

Gonzalo , Wolpaw, Wolpaw. Curricular Transformation in Health Systems Science: The Need for Global Change. Acad. Med 2018

Butler et al. It Feels Like a Lot of Extra Work: Resident Attitudes About QI and Implications for an Effective Learning Health Care System. Acad Med 2017

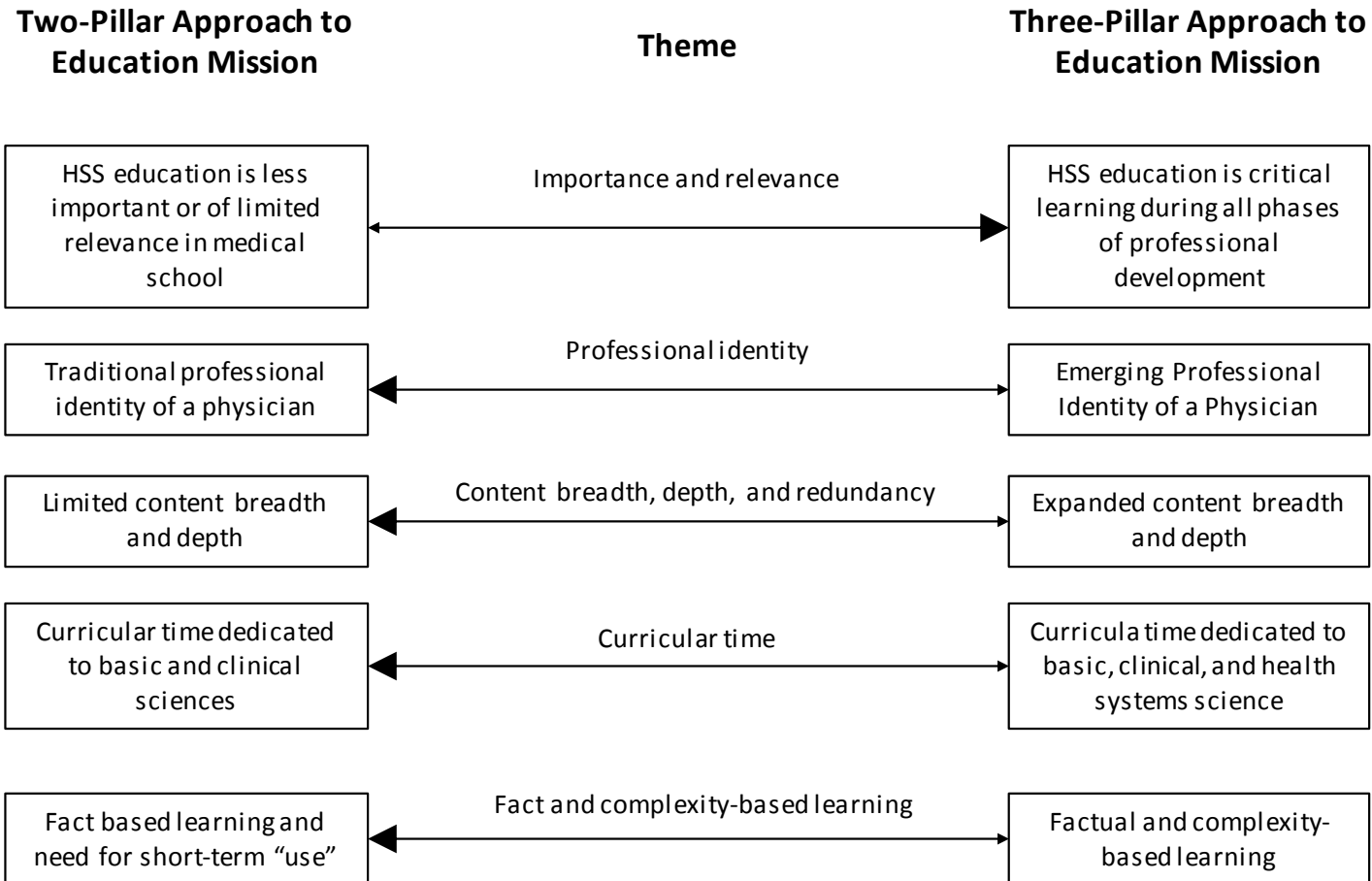
Gonzalo et al. Concerns and Recommendations for Integrating Health Systems Science into Medical Student Education. Acad Med 2017

Gonzalo JD, et al. Exploring challenges in implementing a health systems science curriculum. Medical Education 2015



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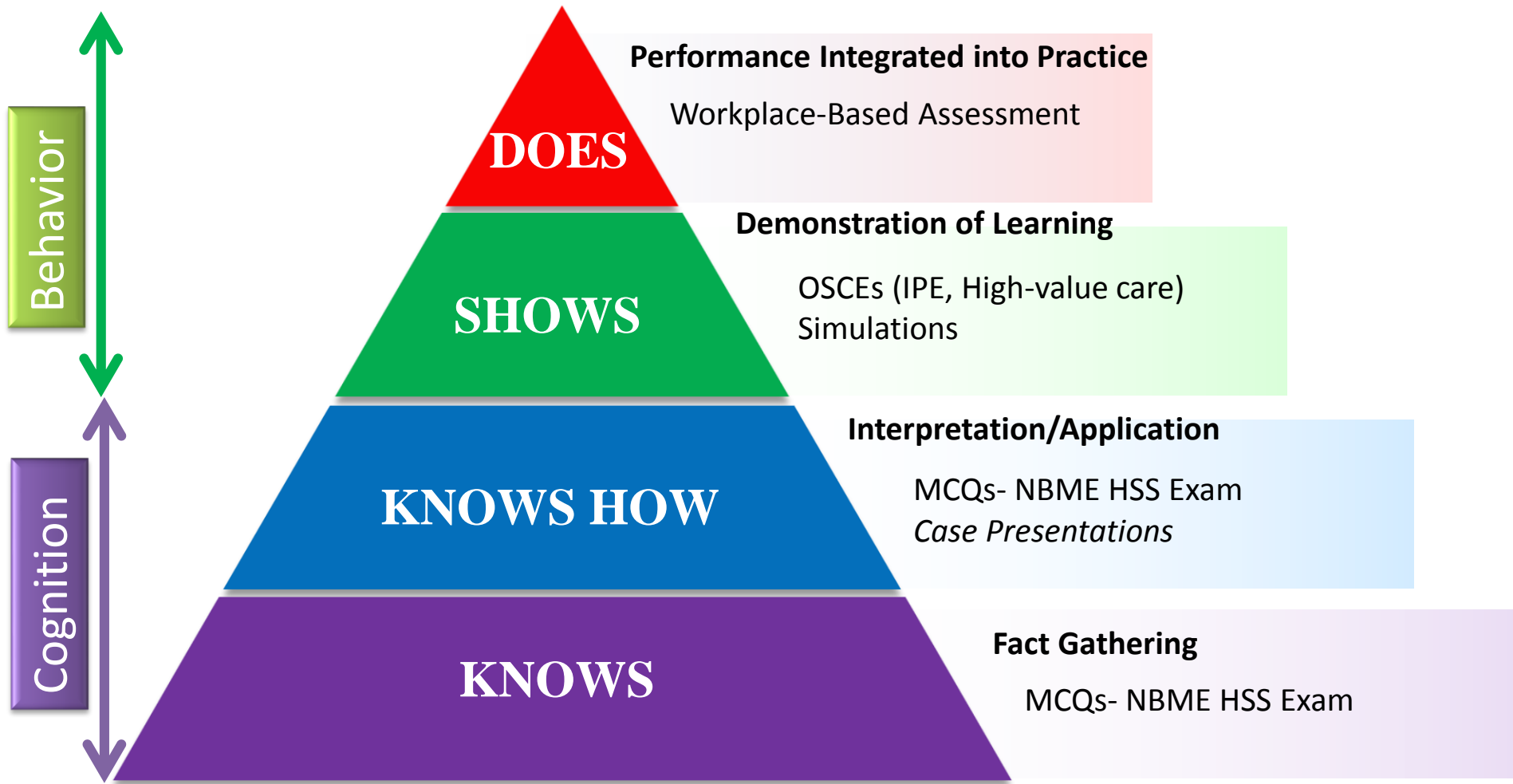
Unpacking Learner Tensions



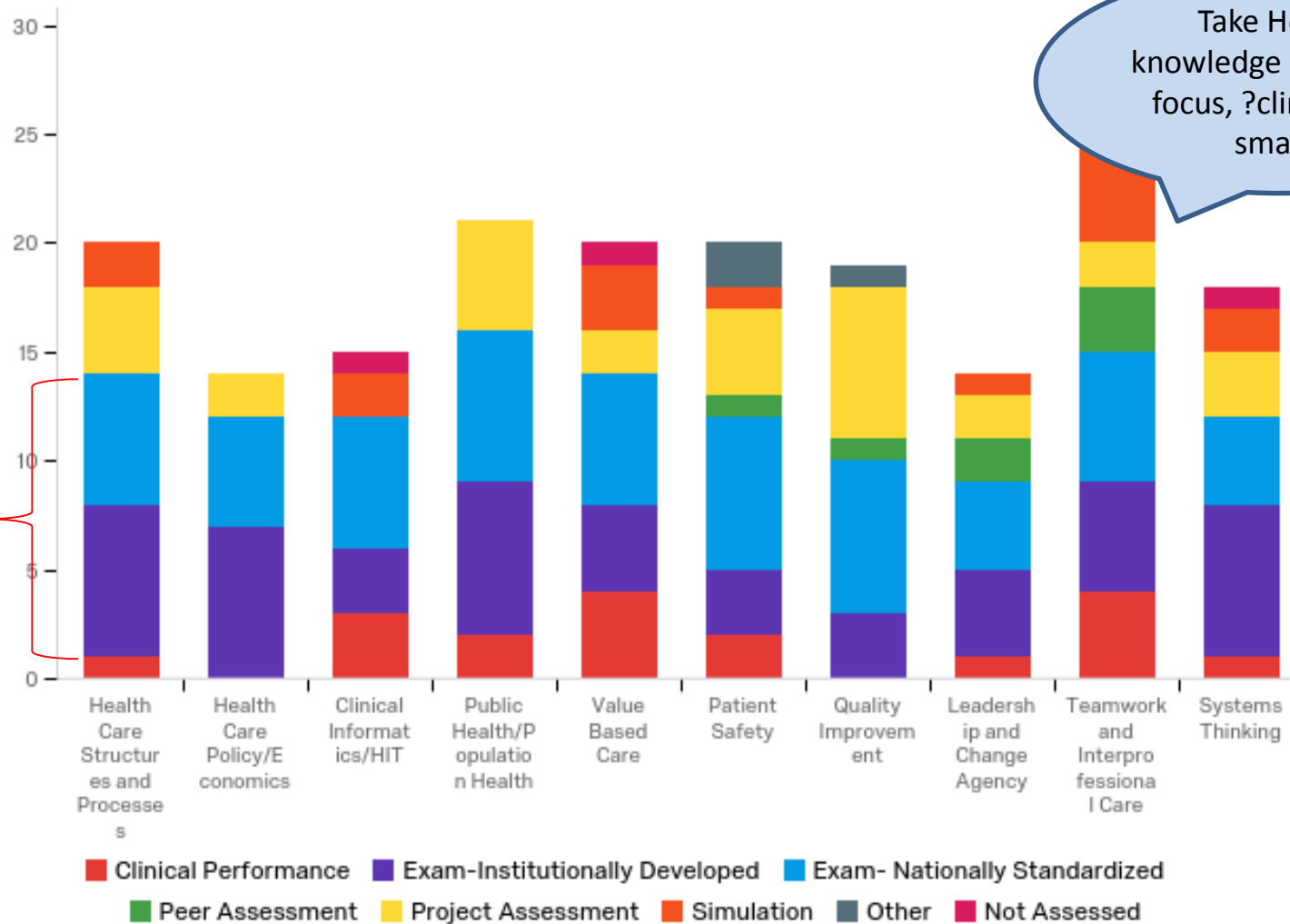
Assessment and Evaluation



Student Assessment



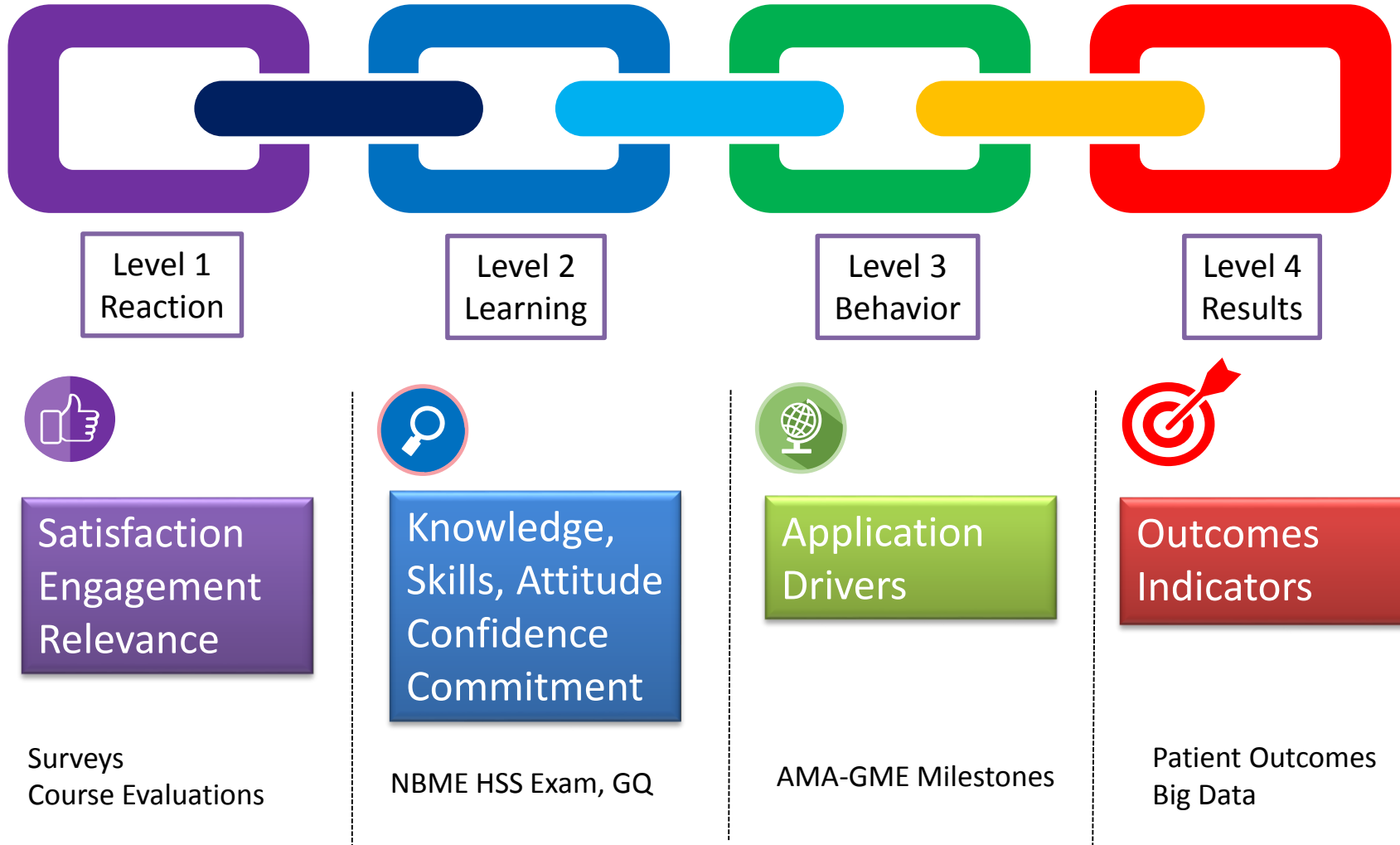
Assessment Methods



Take Home: knowledge is primary focus, ?clinical too small?

Knowledge-based exams

Program Evaluation



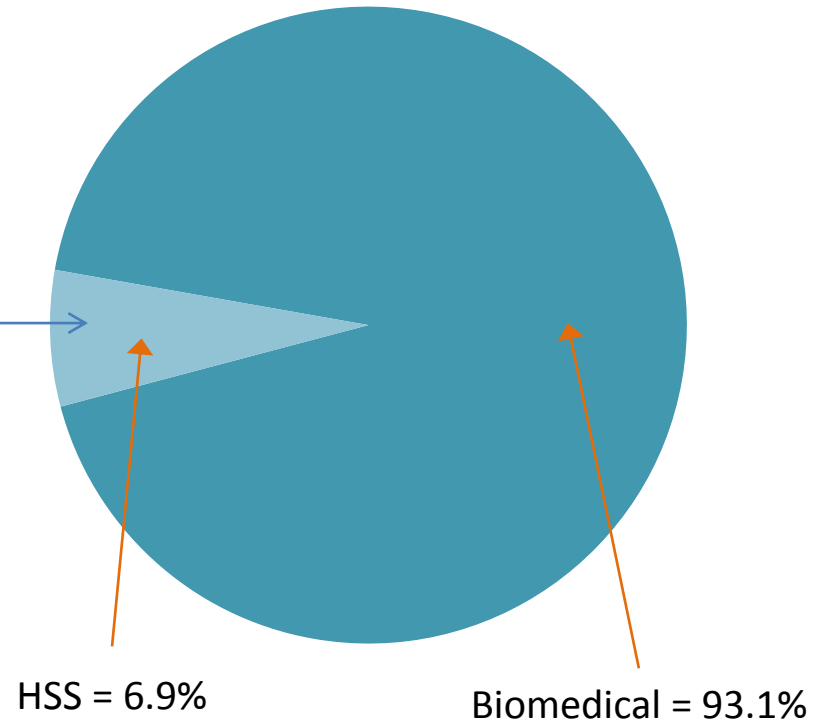
United States Medical Licensing Examination



USMLE Content

1. **Behavioral Health**
 - Patient adherence
2. **Epidemiology/Population Health**
 - Epidemiology/population health
3. **Social Sciences**
 - Communication/cultural competence
 - Death/dying and palliative care
4. **Systems-based practice**
 - Complexity/systems thinking
 - Quality improvement
 - Patient Safety
 - Health care policy and economics

HSS vs. Biomedical Content



USMLE Content

Step 1 and Step 2 CK content changes

At the direction of USMLE Management Committee and approved by USMLE Composite Committee

- Step 1: add questions assessing communication skills
- Step 2 CK: add questions on:
 - systems-based practice
 - patient safety
 - legal/ethical issues
 - professionalism
- Examination length will remain unchanged
- Updated USMLE practice questions - early 2020

Sample topics (sub-competencies)

- Communication skills
 - Information gathering, e.g., exploring patient's reaction to illness
- Legal/ethical issues
 - Recognizes patient's right to refuse treatment or testing
 - Knows guidelines for treatment of minors
- Systems-based practice and patient safety
 - Health systems science principles
 - Strategies to reduce errors in transition of care

NBME HSS Examination



NBME HSS Exam Blueprint



American Medical Association
In collaboration with the National Board of Medical Examiners®



HEALTH SYSTEMS SCIENCE EXAMINATION

Score categories*

Core Domains

Health Care Economics and Policy	8-12%
Health Care Structures and Processes	13-17%
High-Value Care (including Patient Safety)	23-27%
Informatics	8-12%
Population Health, Social Determinants, Health Disparities	23-27%
Quality Improvement	13-17%

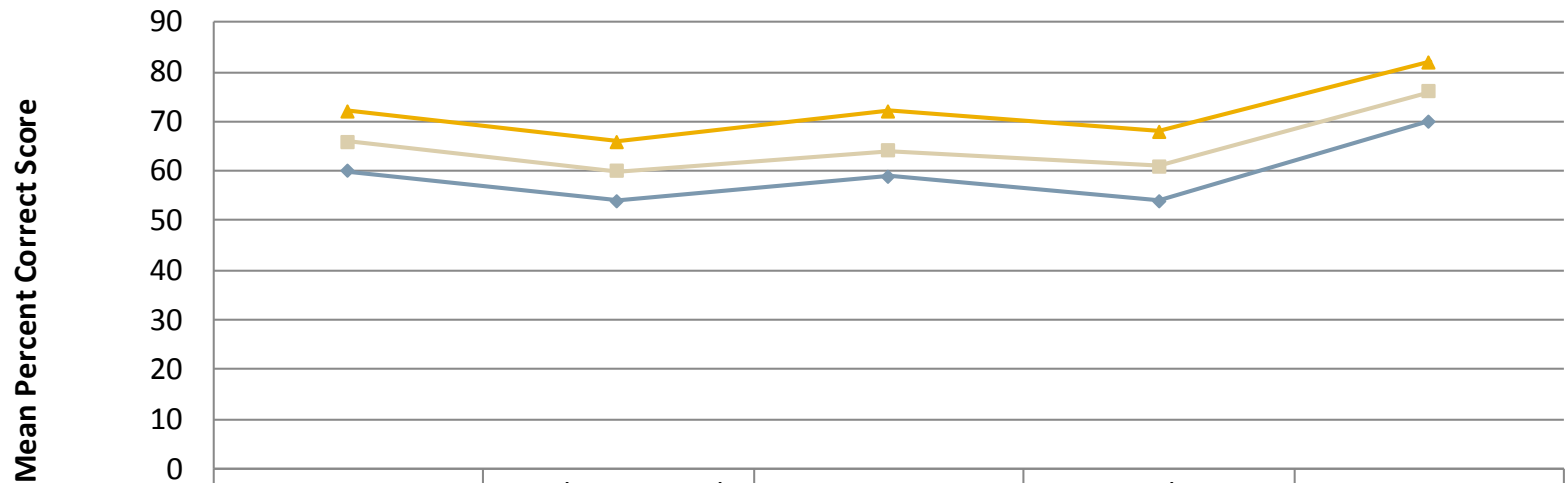
Cross-cutting Domains

Evidence-Based Practice	18-22%
Leadership and Change Management	8-12%
Patient-Centered Care	18-22%
Systems Thinking	28-32%
Teamwork and Communication	18-22%



NBME HSS Exam Blueprint

Mean Performance of All First-time Takers by Test Purpose (n=1631)



	Total Test	Evidence-Based Medicine	Patient Safety	Quality Improvement	Teamwork
◆ Before Instruction	60	54	59	54	70
■ During Instruction	66	60	64	61	76
▲ After Instruction	72	66	72	68	82

- One-way ANOVAs showed statistically significant difference between scores for the 3 test purpose groups
- After instruction had highest total test and content scores



NBME HSS Exam Blueprint

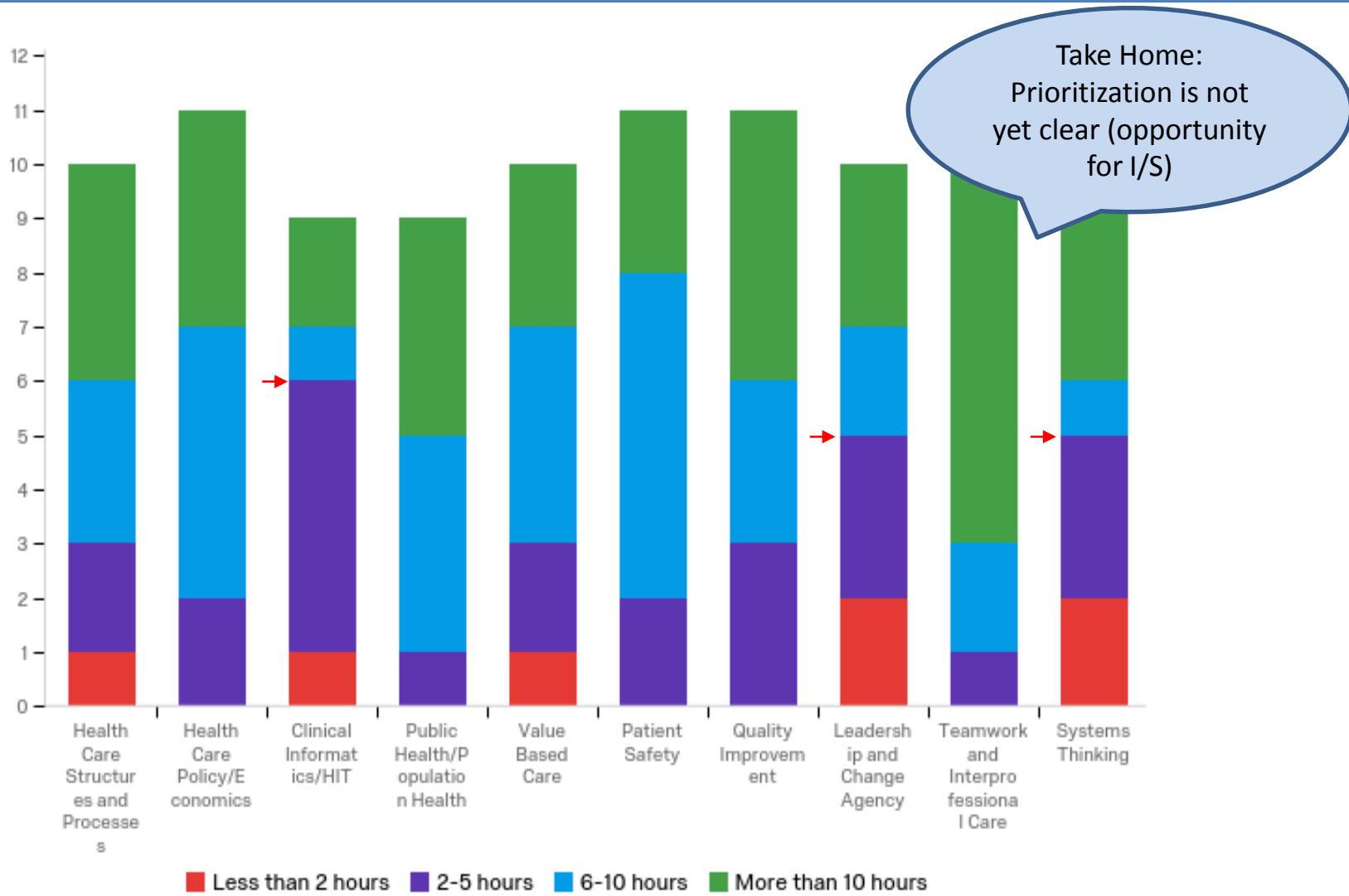
- Establishes initial validity evidence
- Confirms hypothesis
 - Students who take the examination after instruction perform better
- Supports use as a programmatic measure of HSS curriculum effectiveness
- Supports use as a student measure of HSS knowledge and understanding
 - Students can be given formative feedback as HSS content is integrated
 - May be useful for informing decisions about student readiness for clinicals



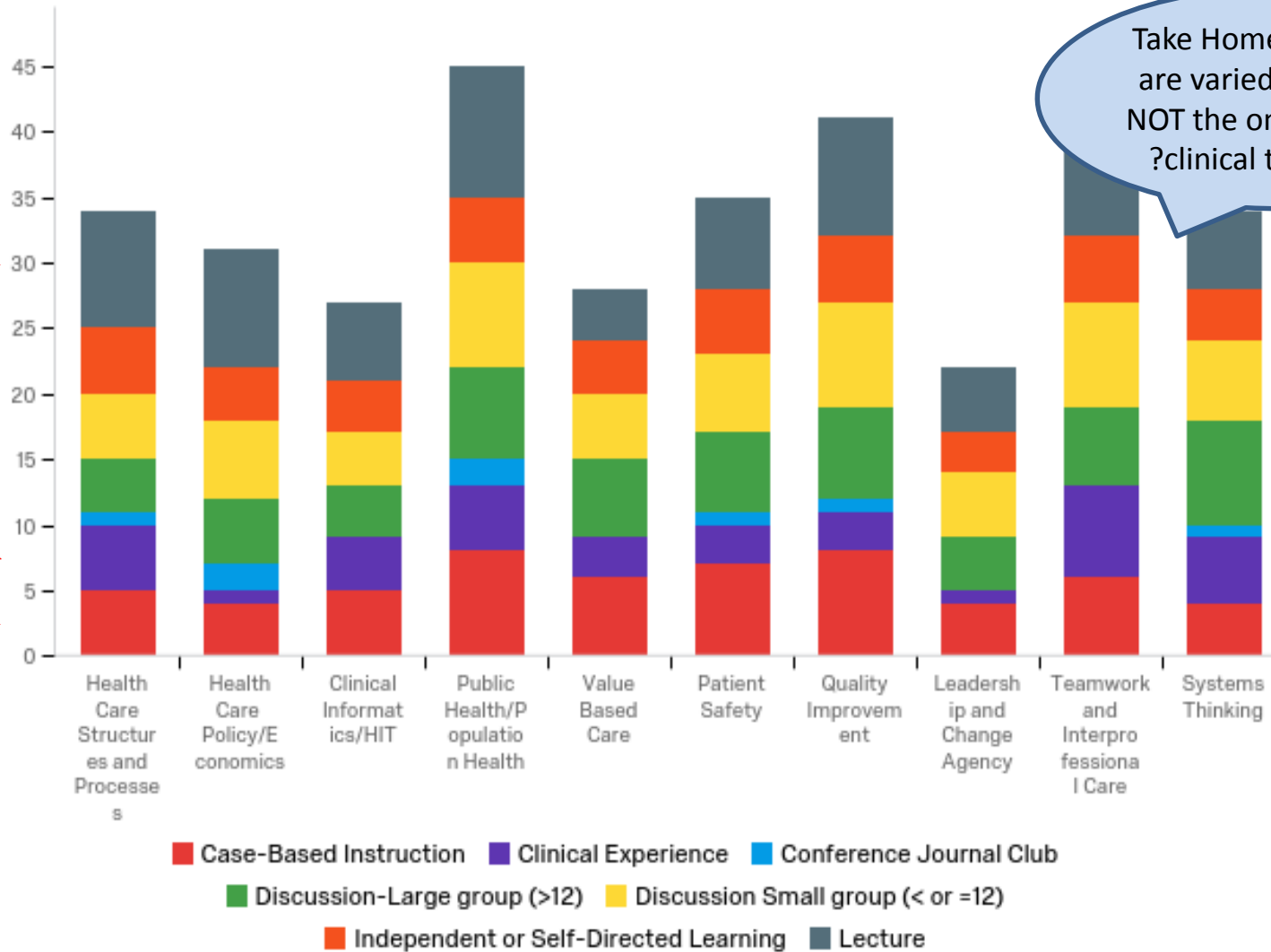
Curricular Prioritization and Teaching Methods



Hours per Competency



Instructional Methods



Take Home: Methods are varied; lecture is NOT the only method; ?clinical too small?



Accreditation



LCME and ACGME

DCI - 3.5 LEARNING ENVIRONMENT/PROFESSIONALISM

'A medical school ensures that the learning environment of its medical education program is conducive to the ongoing development of explicit and appropriate professional behaviors in its medical students, faculty, and staff at all locations and is one in which all individuals are treated with respect.'

CLER Focus Areas/Common Program Requirements

1. Patient Safety
2. Health Care Quality/Disparities
3. Care Transitions
4. Supervision
5. Fatigue Management, Mitigation, and Duty Hours
6. Professionalism



The Graduation Questionnaire



Graduation Questionnaire

- 2011 – 2018:
“I have a fundamental understanding of the issues in social sciences of medicine (e.g., ethics, humanism, professionalism, organization and structure of the health care system).”
- 2018 HSS Task Force request to add:
 1. I have a fundamental understanding of the structure and process of the healthcare delivery system.
 2. I am adequately prepared to collaborate with interprofessional healthcare teams.
 3. I am adequately prepared to participate in health system improvement (e.g. quality improvement, population health improvement, patient safety).
 4. I understand the impact of health policy and medical economics on patient care and health systems.
 5. I understand the role of high value care (e.g. quality, safety, cost) in medical decision-making.
 6. I have the skills to address the social determinants that differentially influence the health status patients and populations.



Graduation Questionnaire

2019 Results of HSS Related Items on the AAMC Graduation Questionnaire

How often did you perform the following activities?	Never	Once	2 to 5 times	> 5 times	Count
Enter and discuss orders and prescriptions	5.4	5.4	26.2	63	16,227
Document a clinical encounter in the patient record	1.3	1.7	13.4	83.6	16,240
Give or receive a patient handover to transition care responsibility	6.5	5.9	29.7	58	16,212
Collaborate as a member of an interprofessional team	2.2	2.4	16.3	79.1	16,205
Obtain informed consent for tests and/or procedures	20.9	11.2	33.8	34.1	16,204
Report patient safety concerns using system reporting structures	67	12.3	11.3	9.3	16,191

How much do you agree about your preparedness for beginning a residency program	St. Disagree	Disagree	Neutral	Agree	St. Agree	Count	
Enter and discuss orders and prescriptions	2	7.9	16.8	38.6	34.7	16,086	
Document a clinical encounter in the patient record	0.2	0.5	2.6	28.9	67.9	16,034	
Give or receive a patient handover to transition care responsibility	0.7	3.2	10.7	41	44.4	16,080	
Collaborate as a member of an interprofessional team	0.2	0.3	2.2	26.5	70.8	16,061	
Obtain informed consent for tests and/or procedures	1.4	5.9	14.1	40	38.6	16,082	
Report patient safety concerns using system reporting structures	2.8	11.9	24.3	33.1	27.9	16,077	
I have the communication skills necessary to interact with patients and health professionals	0.2	0.2	1.3	21.8	76.6	16,164	old item
I have basic skills in clinical decision making and the application of evidence based information to medical practice	0.3	0.6	3.7	39.9	55.5	16,165	old item
I have a fundamental understanding of the issues in social sciences of medicine (e.g., ethics, humanism, professionalism, organization and structure of the health care system)	0.3	1.1	4.1	34.3	60.2	16,171	old item
I understand the ethical and professional values that are expected of the profession	0.2	0.2	1.4	24.1	74	16,154	old item
Apply the principles of high value care (e.g., quality, safety, cost) in medical decision-making	1.3	5.2	16.1	40.2	37.2	16,074	
Address the social determinants that differentially influence the health status of patients	0.6	1.8	7.8	38.6	51.3	16,048	

Objectives

Upon completion of this session, participants will be able to:

1. Identify the key challenges involved with integrating Health Systems Science education into a medical school curricula,
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3. Describe the Health Systems Science areas within accreditation standards, the graduation questionnaire, and board examination blueprints,
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Thank you!



Comments from the “Frontlines”

Importance of Learning HSS

1. “If medical education isn’t broke, don’t fix it.”
2. “HSS is too complex and best learned in residency or practice.”
3. “Early students do not have skills to contribute to health care, and the roles already exist.”
4. “Health Systems Science is not yet a true science.”

Practical Concerns

1. “There is limited space in an already packed curriculum.”
2. “Few faculty have the knowledge and skills to teach HSS.”
3. “Accreditation agencies and licensing boards do not support medical education transformation.”
4. “Evolving health systems are not ready to partner with schools with HSS curricula.”



USMLE CONTENT OUTLINE

Systems-based practice and patient safety

Complexity/systems thinking

Characteristics of a complex system and factors leading to complexity: how complexity leads to error

Sociotechnical systems: systems engineering; complexity theory; microsystems

Health care/organizational behavior and culture: environmental factors, workplace design and process; staffing; overcommitment, space, people, time, scheduling; standardization, reducing variance, simplification, metrics; safety culture; integration of care across settings; overutilization of resources (imaging studies, antibiotics, opioids); economic factors

Quality improvement/Improvement science principles - Variation and standardization: variation in process, practice; checklists, guidelines, and clinical pathways Reliability

Specific models of quality improvement: model for improvement: plan-do-study-act (PDSA), plan-do-check-act (PDCA); Lean, including recognition and types of waste; Six Sigma

Quality measurement Structure, process, outcome, and balancing measures; measurement tools: run and control charts; development and application of system and individual quality measures: core measures; physician quality report system (PQRS); event reporting system

Strategies to improve quality - Role of leadership; principles of change management in quality improvement: specific strategies

Attributes of high-quality health care - High-value/cost-conscious care: overutilization of resources, including diagnostic testing, medications
Equitable care: access; patient-centered care
Timely care

Patient Safety principles - Epidemiology of medical error; error categorization/definition: active vs latent errors; Swiss cheese model of error; preventable vs non-preventable; near miss events/safety hazards

Causes of error

Patient factors: understanding of medication use; health literacy; economic status; cultural factors (eg, religion); failure to make appointments; socioeconomic status

Physician factors: deficiency of knowledge; judgment errors; diagnostic errors; fatigue, sleep deprivation; bias – cognitive, availability, heuristic, anchoring, framing

Human factors (eg, cognitive, physical, environmental)

High reliability of organization (HRO) principles - change management and improvement science; conceptual models of improvement Reporting and monitoring for errors - event reporting systems

Communication with patients after adverse events (disclosure/transparency)

USMLE CONTENT OUTLINE

Specific types of error

Transitions of care errors - handoffs and related communication; discontinuities; gaps; discharge; transfers

Medication errors - ordering, transcribing, dispensing, administration; medication reconciliation

Mathematical error

Procedural errors - universal protocol (time out); wrong patient; wrong site; wrong procedure; retained foreign bodies; injury to structures: paracentesis; bowel perforation; thoracentesis; pneumothorax; central venous/arterial line injuries; arterial puncture and bleeding and venous thrombosis; lumbar puncture bleeding; paralysis

Other errors - anesthesia-related errors; mathematical errors

Health care-associated infections - nosocomial infection – eg, surgical site, ventilator associated, catheter-related; handwashing procedures or inadequate number of handwashing stations; central line-associated blood stream infections; surgical site infections; catheter-associated urinary tract infections; ventilator-associated pneumonia

Documentation errors - electronic medical record (including voice-recognition software errors); record keeping; incorrect documentation (eg, wrong patient, wrong date, copying and pasting, pre-labeling) Patient identification errors

Mislabeling - transfusion errors related to mislabeling; verification/two identifiers: lack of dual validation

Diagnostic errors - errors in diagnostic studies; misinterpretation

Monitoring errors - cardiac monitoring/telemetry Drug monitoring (warfarin, antibiotics)

Device-related errors - malfunction programming error incorrect use

Strategies to reduce error

Human factors engineering - situational awareness

Error analysis tools - error/near miss analysis; failure modes and effect analysis; morbidity and mortality review; root cause analysis Safety behavior and culture at the individual level: hierarchy of health care, flattening hierarchy, speak up to power; afraid to report, fear; psychological safety; closed-loop communication

Teamwork - principles of highly effective teams; case management; physician teams, physician-physician communication; interprofessional/intraprofessional teams; strategies for communication among teams, including system-provider communication, physician-physician communication (eg, consultations), interprofessional communication, provider-patient communication

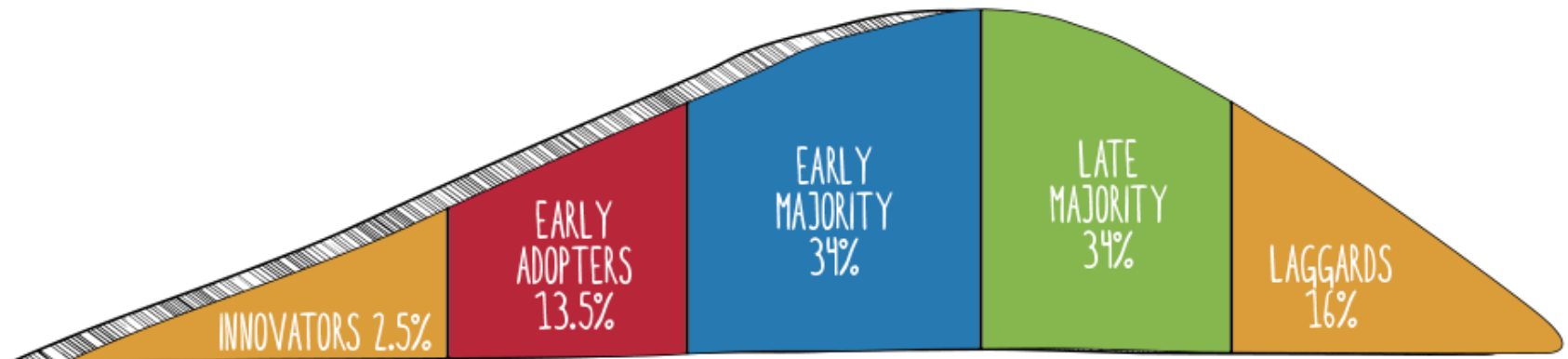
Health care policy and economics

Health care disparities - race/ethnicity; numeracy/literacy; socioeconomic status; access to care: critical access systems; social justice

Health care economics/Health care financing - Types of insurance: Medicare, Medicaid, private insurance, self-pay

Navigating the insurance system: deductibles/co-pays; in-/out-of-network; preferred providers Reimbursement issues affecting safety and quality: emergency services – EMTALA; pay-for-performance

DIFFUSION OF INNOVATION MODEL



80:20





Toan Do, MEd

@ToanTDo

Following



Med students, for preclinical years, what is the breakdown of your study resources? Lectures vs third party resources (sketchy, pathoma, b&b, etc)?

- 7% 100% lecture
- 21% 75% lecture, 25% TPR
- 21% 50% lecture, 50% TPR
- 51% 25% lecture, 75% TPR ✓

14 votes • 5 days left

7:49 AM - 19 Jan 2020

3 Likes



Tweet your reply



Corey Kronman @CoreyKronman · 19h



Replying to @ToanTDo

Is there a 100% TPR option



Toan Do, MEd @ToanTDo · 19h



I ran out of possible tabs, but I would be in the 100% TPR as well :)



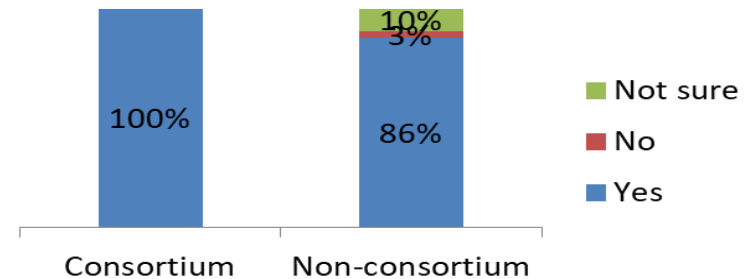
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Background/Methodology

- Data needed to understand current and future usage of HSS curriculum and exam
- Online survey
- N=26 consortium school respondents; 37 non-consortium school respondents
- Comparisons of consortium versus non-consortium school results

Very high awareness of HSS curriculum

Is some aspect of HSS part of the curriculum at your school?



But implementation by topic is varied ...

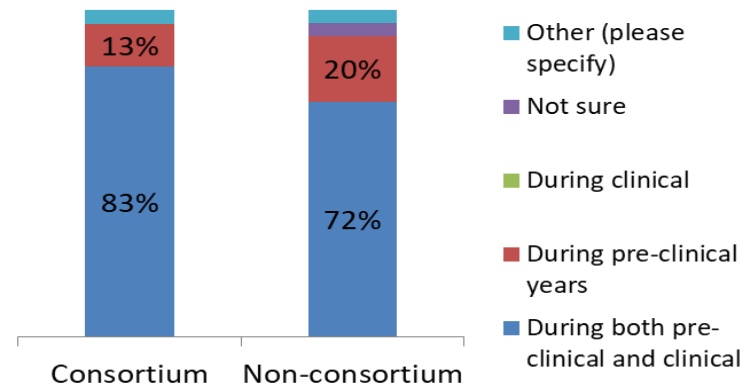
... as is implementation timing/cohort

Is some aspect of Health Systems Science part of the curriculum at your school, either as an independent course or with topics covered in multiple courses?

HSS Topic - % YES Shown	Consortium	Non-consortium
Teamwork and Communication	100% ↑	83%
High Value Care (including Patient Safety)	96%	79%
Population Health, Social Determinants, Health Disparities	96%	90%
Quality Improvement	96%	83%
Evidence-Based Practice	96%	93%
Patient-Centered Care	96% ↑	72%
Health Care Structures and Processes	91% ↑	66%
Systems Thinking	91% ↑	41%
Health Care Economics and Policy	87%	69%
Informatics	78%	52%
Leadership and Change Management	70%	45%

↑↓ = Significant difference at the $\alpha=.10$ level

When HSS Is Taught Currently

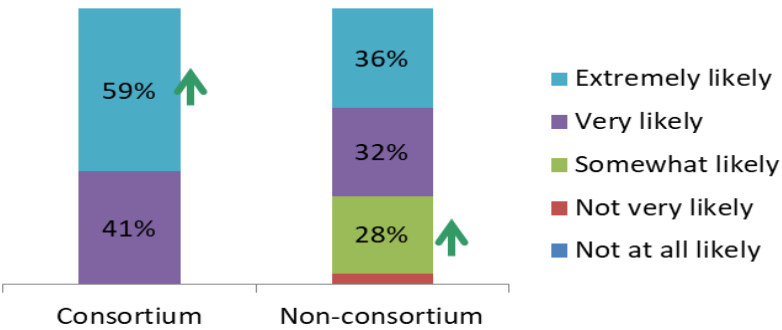
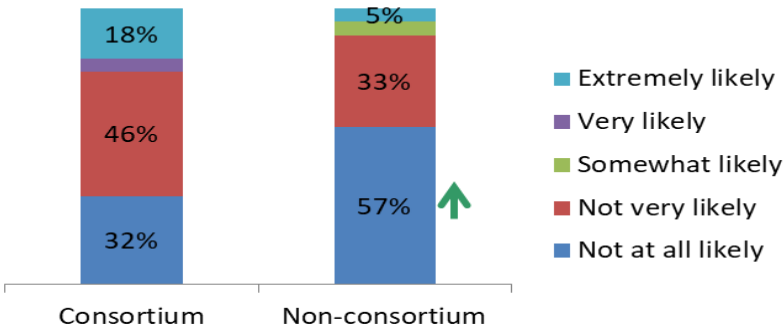


HSS unlikely to be taught in one class

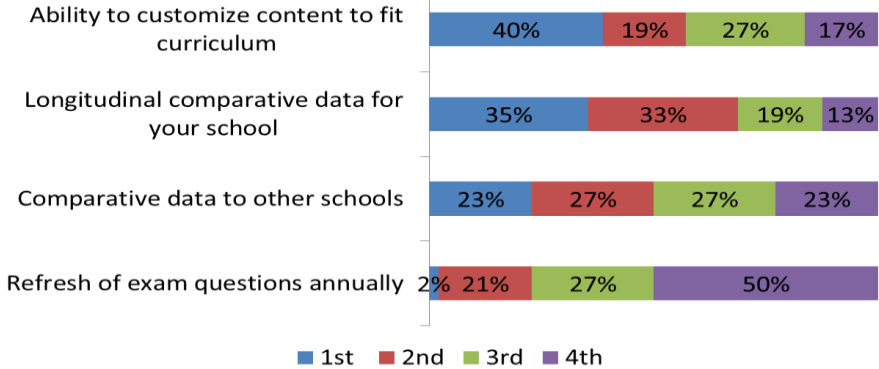
HSS more likely to be integrated with clerkships

All HSS content in one independent class

Integrated with Clinical Clerkships



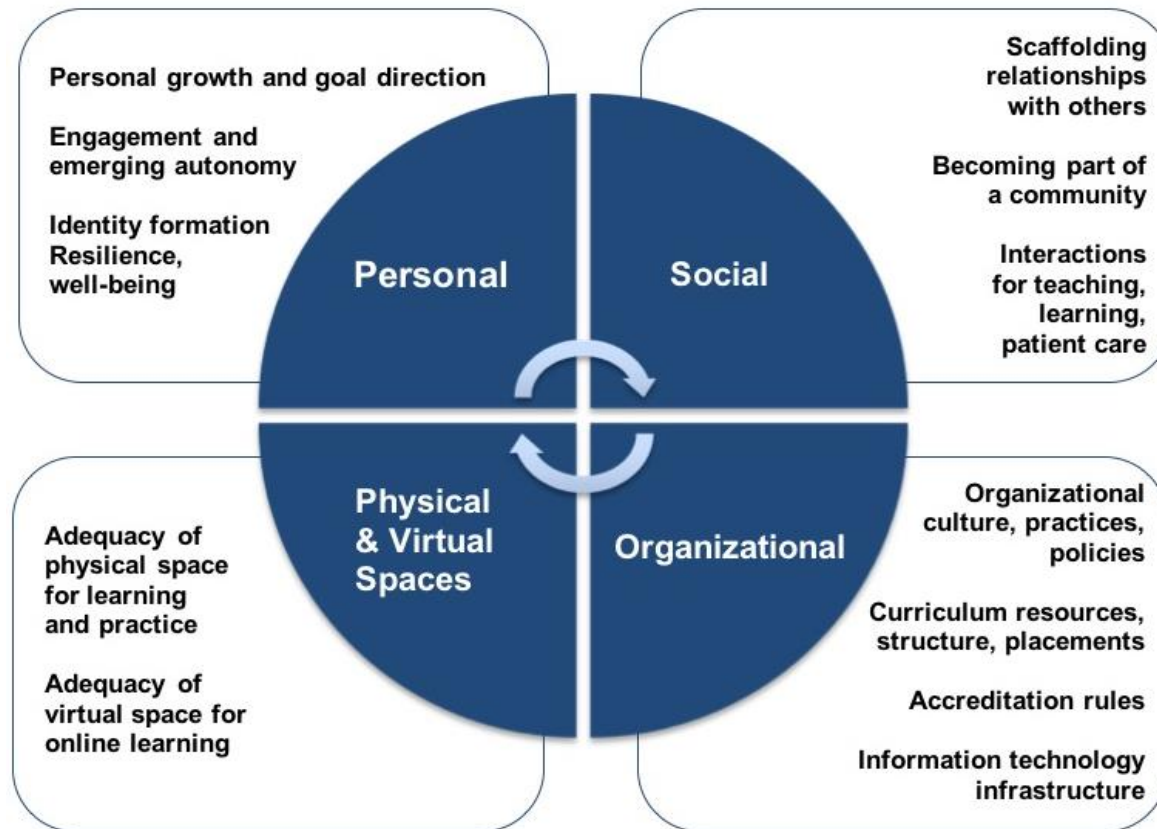
Fit with curriculum and longitudinal comparisons more important than annual refresh of content



Base: all responding
 No significant difference between groups
 N=48

The Clinical Learning Environment

Definition: The learning environment refers to the social interactions, organizational culture and structures, and physical and virtual spaces that surround and shape the learners' experiences, perceptions, and learning.



Macy Foundation Conference on the Clinical Learning Environment (Gruppen, Irby, Durning, Maggio, van Schaik)

T. Brigham. Knitting the Continuum Together: Seizing the Opportunity to Improve Medical Education. www.acgme.org

Asch et al. Evaluating Obstetrical Residency Programs Using Patient Outcomes. JAMA 2009

Hunderfund, A. et al. Role modeling and regional health care intensity: experiences with cost-conscious care. Acad Med 2016

Gonzalo et al. A Constructive Reframing of Student Roles Using a "Communities of Practice" Lens. Acad Med 2017



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