The Importance of Developmental Thinking for Assessment in Outcomes-based Medical Education

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Financial Disclosures

I currently work for Intealth and previously worked for ACGME. The contents of this presentation were mostly developed based on work at ACGME.

I receive royalties from Elsevier publishing for a textbook on assessment.

January 2020

BRIEF REPORT

First Case of 2019 Novel Coronavirus in the United States

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SUMMARY

An outbreak of novel coronavirus (2019-nCoV) that began in Wuhan, China, has spread rapidly, with cases now confirmed in multiple countries. We report the first case of 2019-nCoV infection confirmed in the United States and describe the identification, diagnosis, clinical course, and management of the case, including the patient's initial mild symptoms at presentation with progression to pneumonia on day 9 of illness. This case highlights the importance of close coordination between clinicians and public health authorities at the local, state, and federal levels, as well as the need for rapid dissemination of clinical information related to the care of patients with this emerging infection.

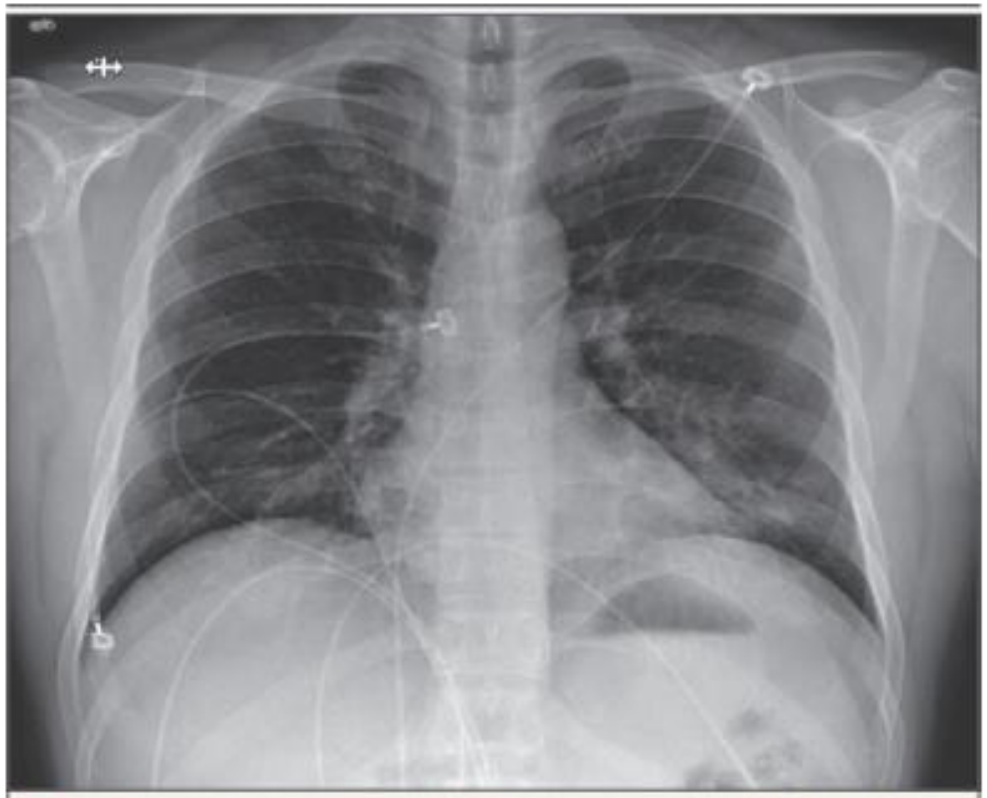
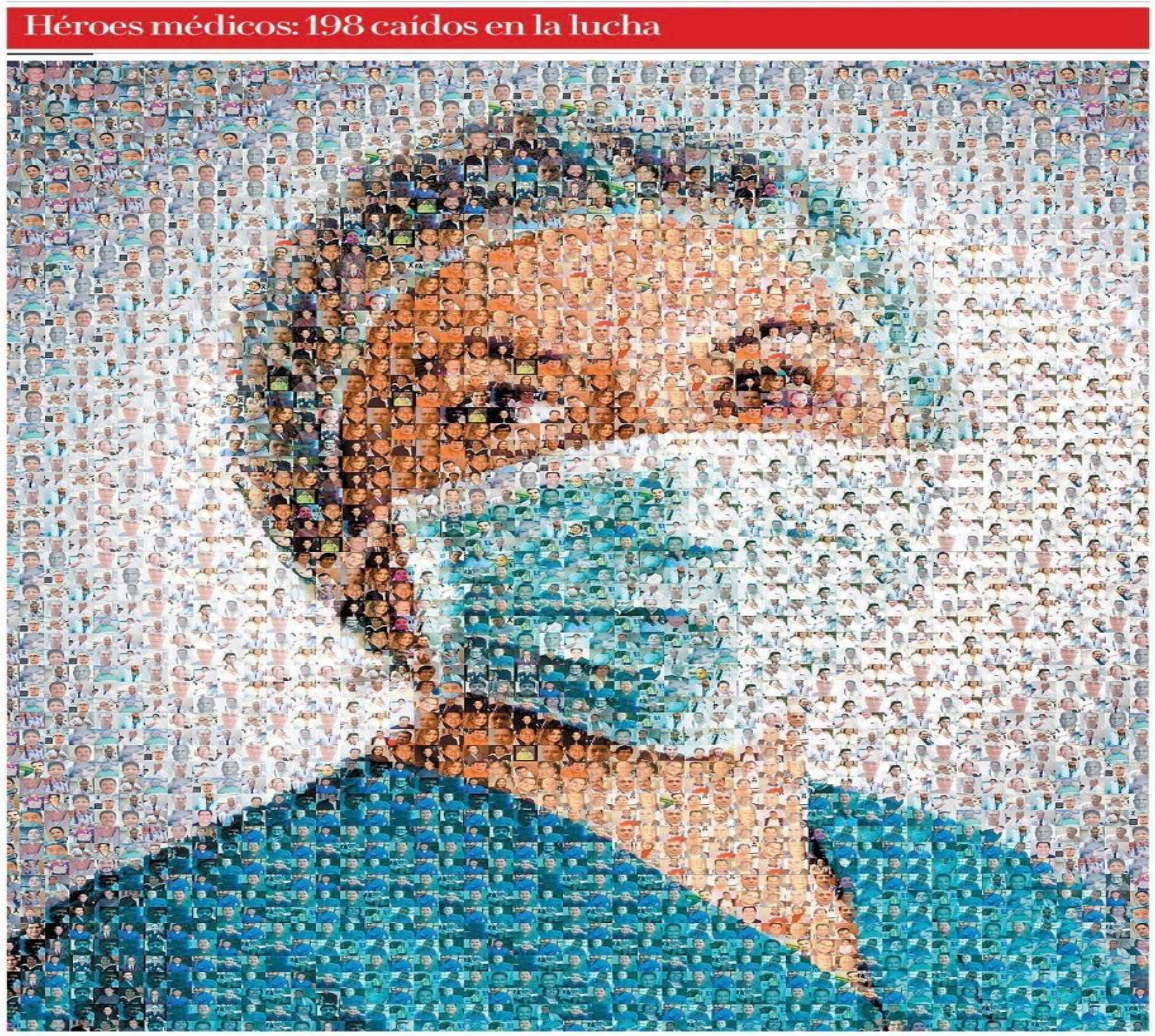
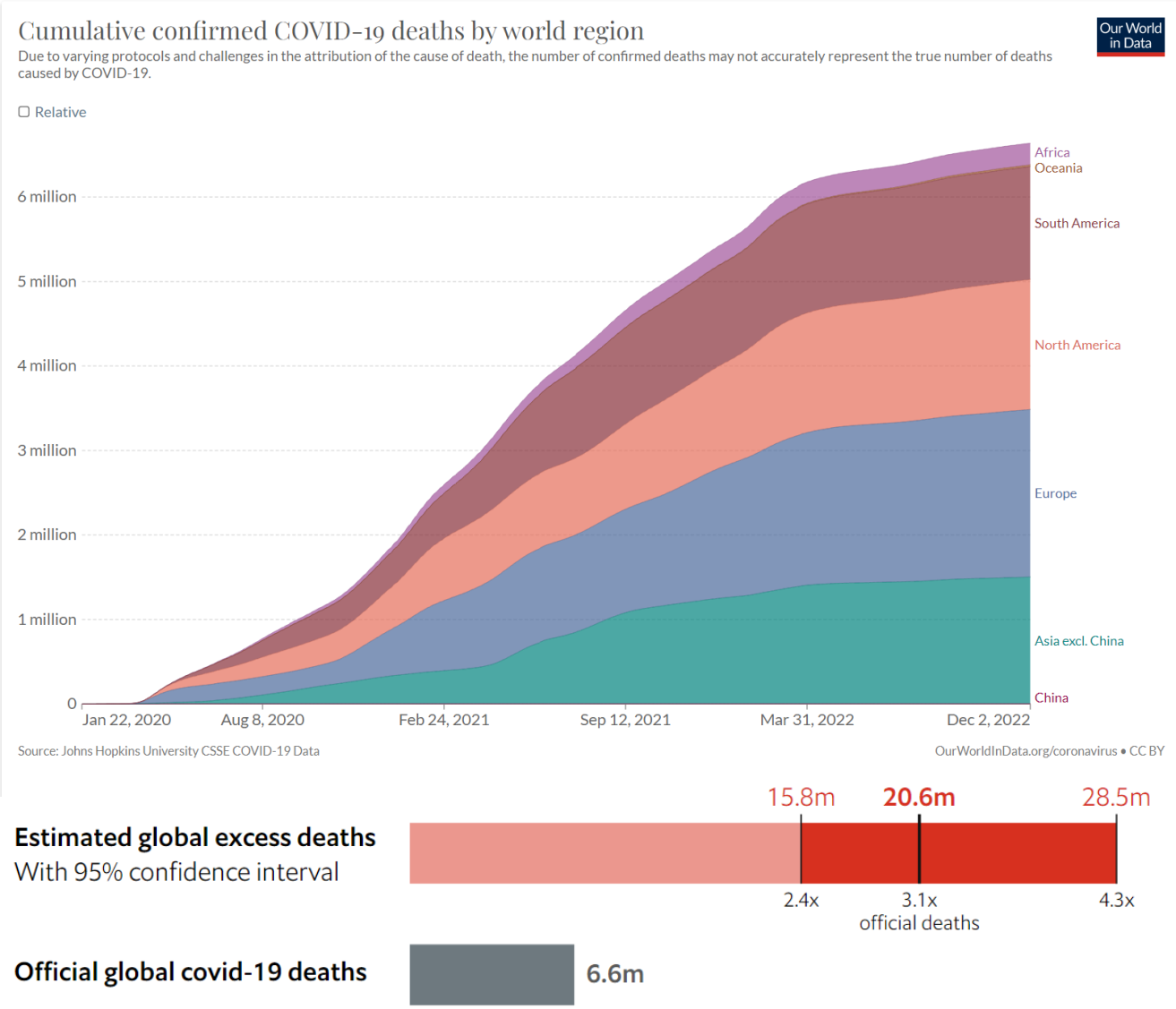


Figure 4. Posteroanterior Chest Radiograph, January 24, 2020 (Illness Day 9, Hospital Day 5).

Increasing left basilar opacity was visible, arousing concern about pneumonia.

Thank You
It Has Been a Very Difficult 4 Years





Outline

- OBME – a brief review
- What professional development looks like
- Thinking developmentally in assessment
- Programmatic assessment
- Coproduction and developmental assessment

Brief Review of Outcomes-based Medical Education

Outcomes-based Education: What is it?

- Central tenet: *start with the end in mind*
  - Focus on what type of physician will be produced
  - Structure and process flow from the outcomes
- Educational outcomes should be "*clearly and unambiguously specified*."
- These educational outcomes determine:
  - Curriculum, assessment processes, and the learning environment

© AAFP: Collaboration Improves Patient Outcomes, Lowers Cost (aafp.org)

Harden RM. Outcomes-based education: Part 1-An introduction to outcomes-based education. Med Teach. 2009; 21: 7-14.

Operationalizing Outcomes: CBME

An approach to preparing physicians for practice
that is fundamentally oriented to graduate outcome abilities
and organized around competencies
derived from an analysis of ***societal and patient needs***.

It de-emphasizes time-based training and promises greater accountability, flexibility and learner-centeredness"

Frank et al. Toward a definition of CBME. Med Teacher 2010

Competency: A Definition

- Competency: An observable ability of a health professional, integrating multiple components such as knowledge, skills, values and attitudes.

Frank, JR, Snell LS, ten Cate O, et. al. Competency-based medical education: theory to practice. Med Teach. 2010; 32: 638–645

Competency Frameworks

Competencies are structured *frameworks* to guide curriculum and assessment

- Competency frameworks help build ***shared mental models***

They ***do not*** represent the ***totality*** of a healthcare discipline or of all professional development

Competencies help to define the *educational outcomes* (abilities) of individuals

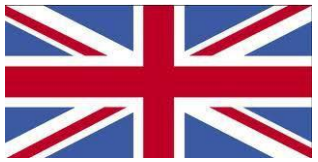
Competency Frameworks*

CanMeds

- Medical Expert
- Communicator
- Collaborator
- Leader
- Health advocate
- Scholar
- Professional

ACGME

- Medical knowledge
- Patient care
- Practice-based learning & improvement
- Interpersonal and communication skills
- Professionalism
- Systems-based practice



GMC

- Good clinical care
- Relationships with patients and families
- Working with colleagues
- Managing the workplace
- Social responsibility and accountability
- Professionalism

From CPM Van Der Vleuten

Core Components Framework (CCF)

Outcome Competencies	Sequenced Progression	Tailored Learning Experiences	Competency-focused Instruction	Programmatic Assessment (using Systems Thinking)
Competencies required for practice are clearly articulated.	Competencies and their developmental markers are *sequenced progressively*.	Learning experiences *facilitate*…	Teaching practices *promote*…	Assessment practices *support & document*…
		….the developmental acquisition of competencies.		

Van Melle E, et. al. A Core Components Framework for Evaluating Implementation of Competency-Based Medical Education Programs. Acad Med. 2019 Jul;94(7):1002-1009.

Philosophical Principles of CCF

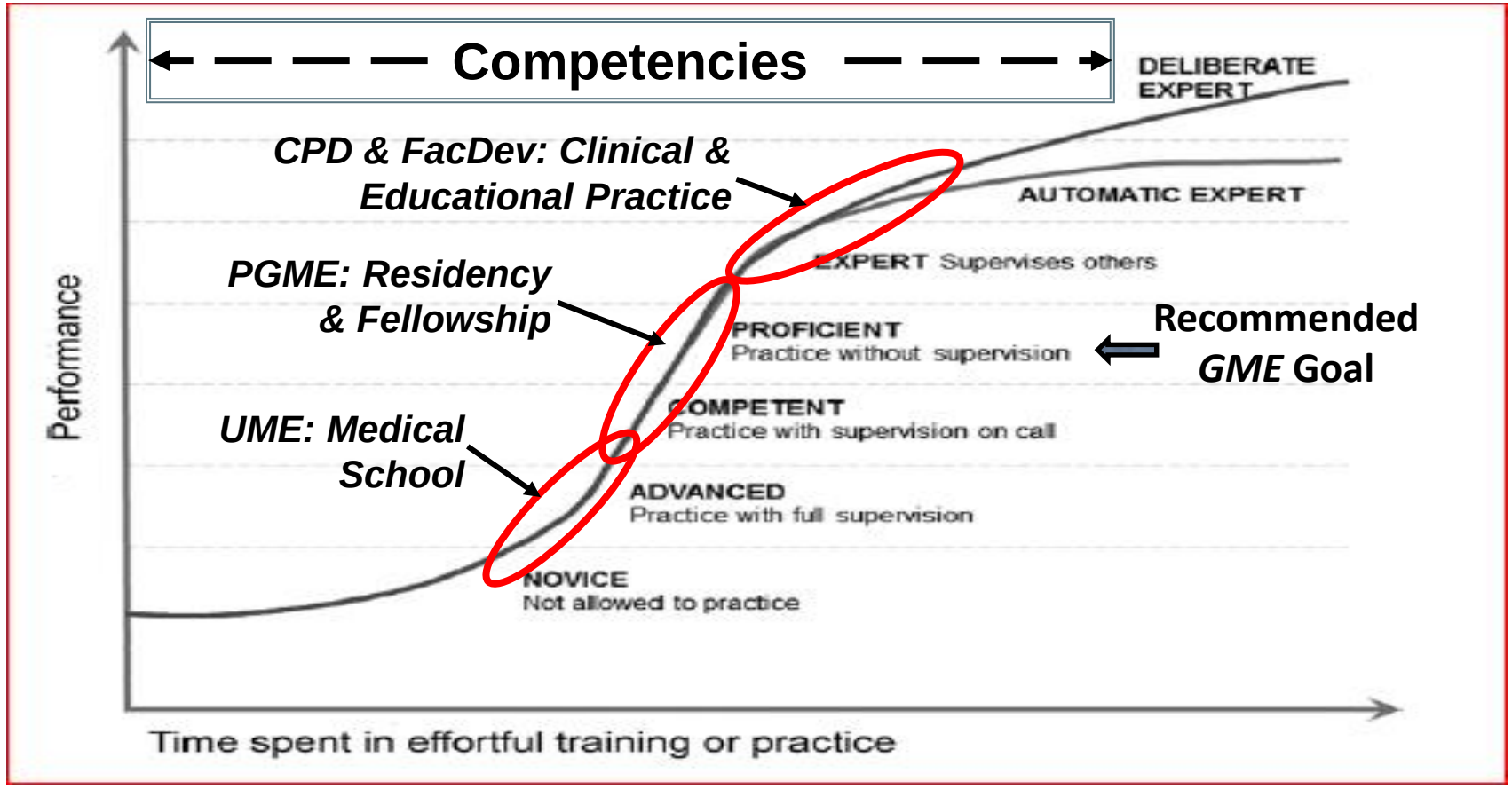
Grounded in a "***growth***" mindset:

- Forms the basis for significantly redesigning assessment practices, instructional methods and learning experiences
- Focused on promoting learner growth and development through frequent formative assessment
- Rich in feedback/coaching individualized to the learner and grounded in the desired competencies.
- Provides rich and diverse learning experiences, steeped in clinical practice where learners can stay *as long as required*

Van Melle E, et. al. A Core Components Framework for Evaluating Implementation of Competency-Based Medical Education Programs. Acad Med. 2019 Jul;94(7):1002-1009.

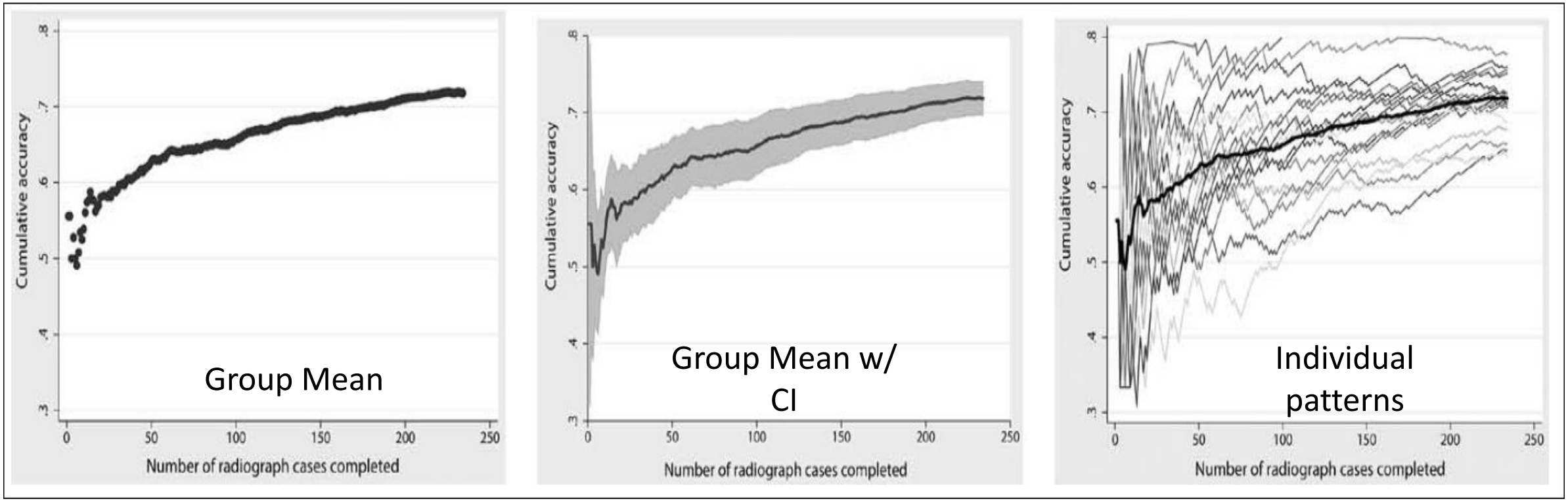
What Development Really Looks Like

Learning Curves and Developmental Models



Pusic M et. al. Acad Med. 2014

Reading Radiographs: An Example



18 residents reading pediatric ankle radiographs

From Pusic, et. al. Acad Med. 2014

Pair and Share

- How does a system of providing grades support or hinder professional development?
- What does a "grade" actually mean in developmental terms?

MTSD Grading System & Decile Rank

Grade	NGA	GPA
A	90-100%	4.0
B+	87-89%	3.6
B	83-86%	3.3
B-	80-82%	3.0
C+	77-79%	2.6
C	73-76%	2.3
C-	70-72%	2.0
D+	67-69%	1.6
D	63-66%	1.3
D-	60-62%	1.0
F	Below 60%	0.0

NGA = Numeric Grade Average (100 scale)
GPA = Grade Point Average (4.0 scale)
F = Fail
M = Medical
I = Incomplete
P = Passing
WP = Withdrew Passing
WF = Withdrew Failing
EPG = Educational Planning Guide

Thinking Developmentally: Progressive Sequencing and Tailoring of Learning and Teaching

Dreyfus Developmental Model Stages

Dreyfus Stage	Description
Novice	Rule driven; analytic thinking; little ability to prioritize information
Advanced beginner	Able to sort through rules based on experience; analytic and non-analytic for some common problems
Competent	Embraces appropriate level of responsibility; dual processing of reasoning for most common problems; can see big picture; Complex problems default to analytic reasoning. Performance can be exhausting.
Proficient	More fully developed non-analytic and dual process thinking; comfortable with evolving situations; able to extrapolate; situational discrimination; can live with ambiguity
Expert	Experience in subtle variations; distinguishes situations

Deliberate Practice

- "*Individualized training activities especially designed by a coach or teacher to improve specific aspects of an individual's performance through repetition and successive refinement*"

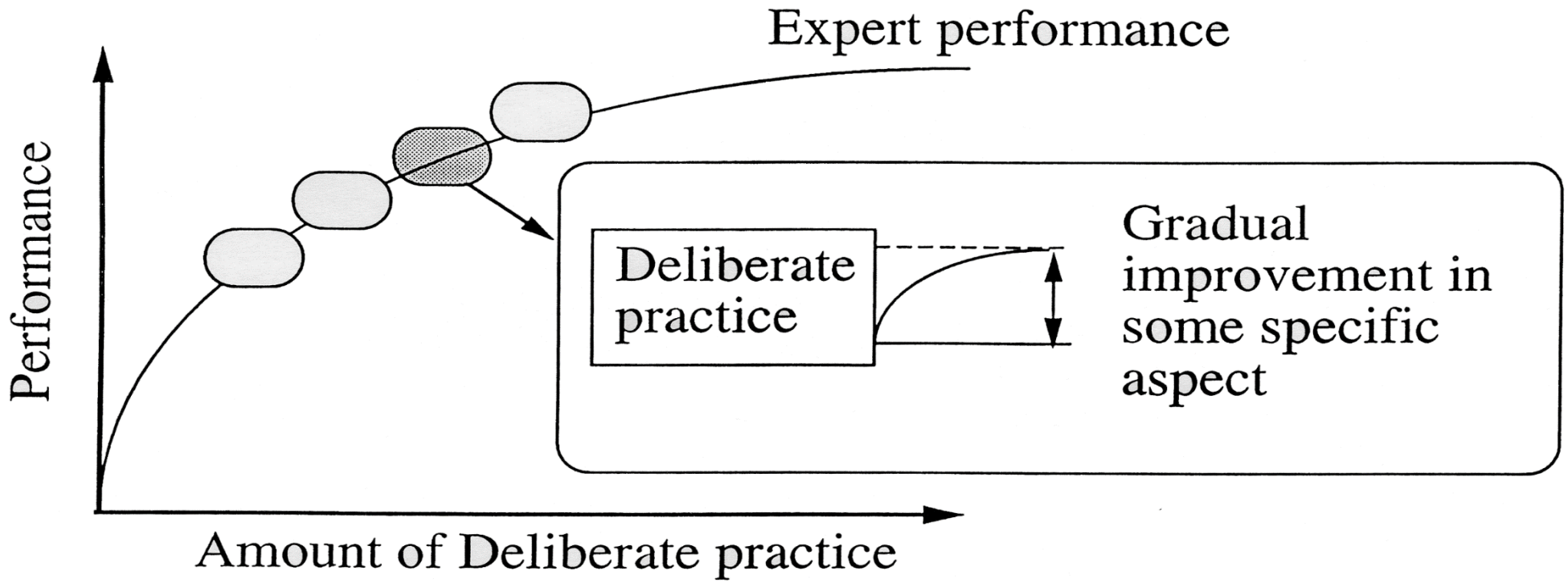
- Requires a field that is reasonably well developed. ***Clear mental representations of the tasks of the field are essential.***

Ericsson: Purposeful Practice…

- Has well defined, specific goals that
  - Arranges steps together to achieve a well-defined goal
- Is focused
- Involves feedback
- Requires getting out of one's comfort zone

…However, "*trying hard and pushing yourself to the limit isn't enough.*"

Design and Sequencing of Training Activities



Professional teachers and coaches*

* Monitor students' development
* design and select training tasks for individual students

Courtesy KA Ericsson

Mastery-based Learning

- Excellence is expected and achievable by all learners who are able, motivated and work hard.
- Little to no variation in measured outcomes.
- Learning in any domain, depends on learning a sequence of less complex components.
- If learners receive optimal quality of instruction and learning time required, the majority of learners should attain mastery.

McGaghie WC. Mastery Learning: It Is Time for Medical Education to Join the 21st Century. Acad Med. 2015;90:1438–1441.

Mastery Model

- Baseline or diagnostic testing
- Clear learning objectives
- Deliberate educational activities
- Minimum passing standards (MPS)
- Formative feedback with actionable feedback
- Evidence-based advancement
- Continued practice and assessment until MPS achieved

McGaghie WC. Mastery Learning: It Is Time for Medical Education to Join the 21st Century. Acad Med. 2015;90:1438–1441.

Thinking Developmentally: Shared Mental Models and Competency Milestones

Definitions

Mental Models (slideshare.net)

- Shared mental models (SMMs)
  - "*Shared understandings or representations of the goal of the team, individual team member tasks, and how team members will coordinate to achieve their common goals; individual team members can have varying degree of overlap or 'sharedness' among their mental model of the team.*"[1]

- Frame of reference (FoR)
  - "*A structure of concepts, values, views, etc., by means of which an individual or group perceives or evaluates data, communicates ideas, and regulates behavior.*"[2]
    - For assessment, how educational outcomes are conceptualized is essential

1. Edgar L, et. al. Better decision-making: shared mental models and the clinical competency committee. J Grad Med Educ. 2021
2. Dictionary.com. Accessed at https://www.dictionary.com/browse/frame-of-reference

Shared Mental Models

- Operate on at least two levels in assessment
  - Individual faculty assessments
    - What “frame of reference” and standard do they use to judge the abilities, clinical care, etc. of a learner?
  - Group judgements such as the clinical competency committee (CCC)
    - How do the CCC members understand the competencies and Milestones they are judging? The assessment data they are reviewing?

Successful Mental Models Meet 3 Criteria

1. The mental model is an accurate reflection of effective educational and clinical practice and current reality, based on best available evidence and correct assumptions;
2. There is agreement among key members (e.g. faculty) about the goal (e.g. competence and what it is) and *how* the group will achieve the goals (e.g. assessment practices); and
3. There is a description of how the group (faculty, program, CCC) will work *together* to achieve the goals.

Adapted from: Edgar L, et. al. Better decision-making: shared mental models and the clinical competency committee. J Grad Med Educ. 2021

Milestones in GME

Describe performance levels for skills, knowledge, attitudes, and behaviors in the six general competency domains in narrative terms.

Provide a framework of observable behaviors and attributes associated with learners' ***development*** as physicians.

Competencies are *interdependent* and help programs to prepare learners to deliver high quality, safe health care.

Nasca, TJ et. al. The Next Accreditation System. NEJM. 2012.366:1051-1056

Milestone Example: Family Medicine

Patient Care 1: Care of the Acutely Ill Patient

Level 4 is the *recommended* graduation goal ≈ proficiency

Focus the assessment on the narrative, not the number

Generates differential diagnosis for acute presentations			nizes rgent oordinates gnostic		Mobilizes the multidisciplinary team to manage care for simultaneous patient visits			Efficiently manages and coordinates the care of multiple patients with a range of severity, including life-threatening conditions	
Recognizes role of clinical protocols and guidelines in acute process	Develops management plans for patients with common acute conditions ss	Implement agement plans for patients with complex acute conditions, including stabilizing acutely ill patients			Independently coordinates care for acutely ill patients with complex comorbidities			Directs the use of resources to manage a complex patient care environment or situation	
		Incorporates psychosocial factors into management plans of acute illness for patients and caregivers			Modifies management plans for acute illness based on complex psychosocial factors and patient preferences			Implements strategies to address the psychosocial impacts of acute illness on populations	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

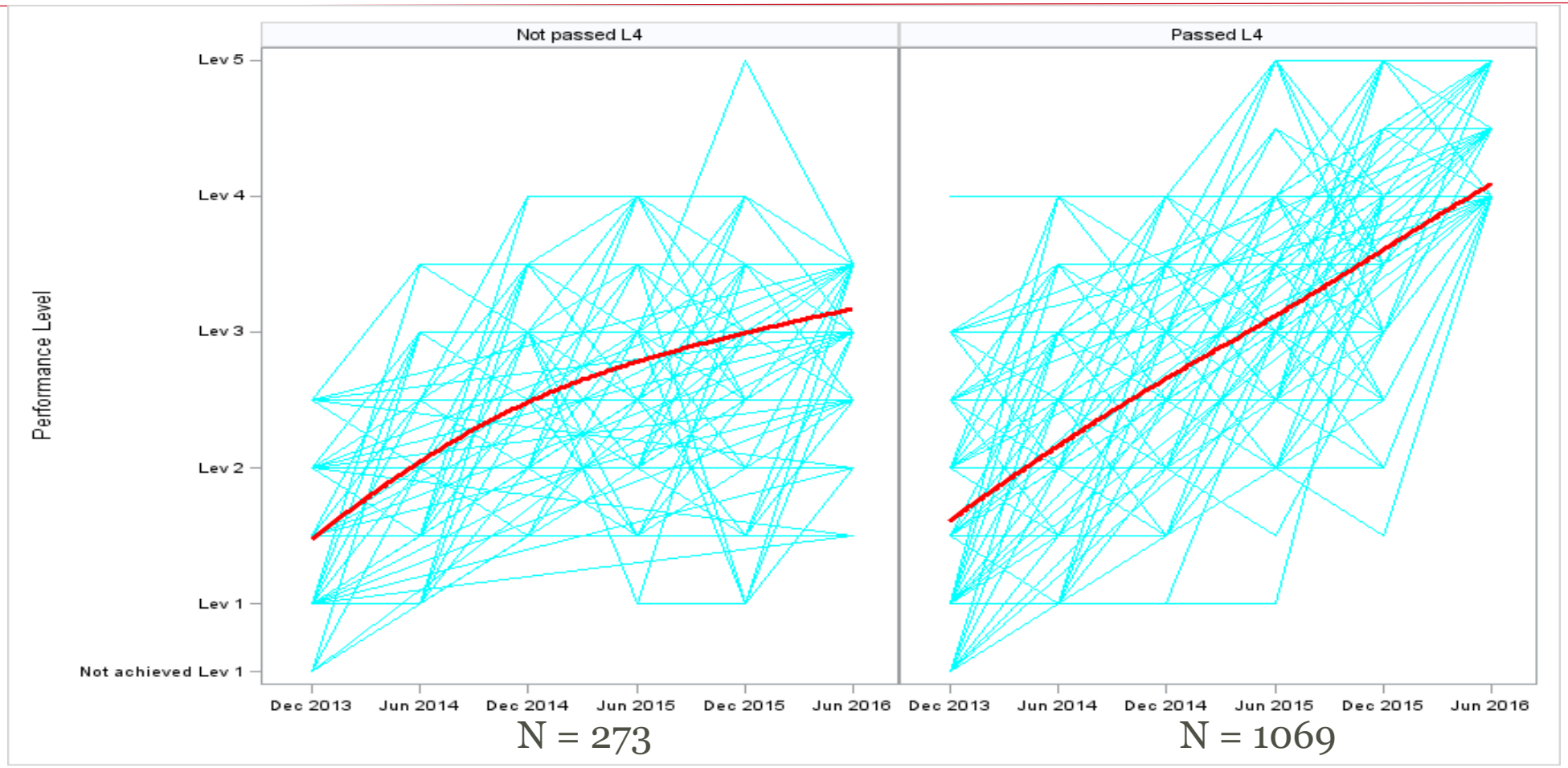
Comments:

Not Yet Completed Level 1 ☐
Not Yet Assessable ☐

Learning Curves and Milestones

From Pusic, et. al. Acad Med. 2014

Resident Trajectories
Wound Management Competency in Emergency Medicine



Pair and Share

- How do your current assessment methods and tools support the professional development of your learners?

- Are they designed to support deliberate practice and mastery-based learning?

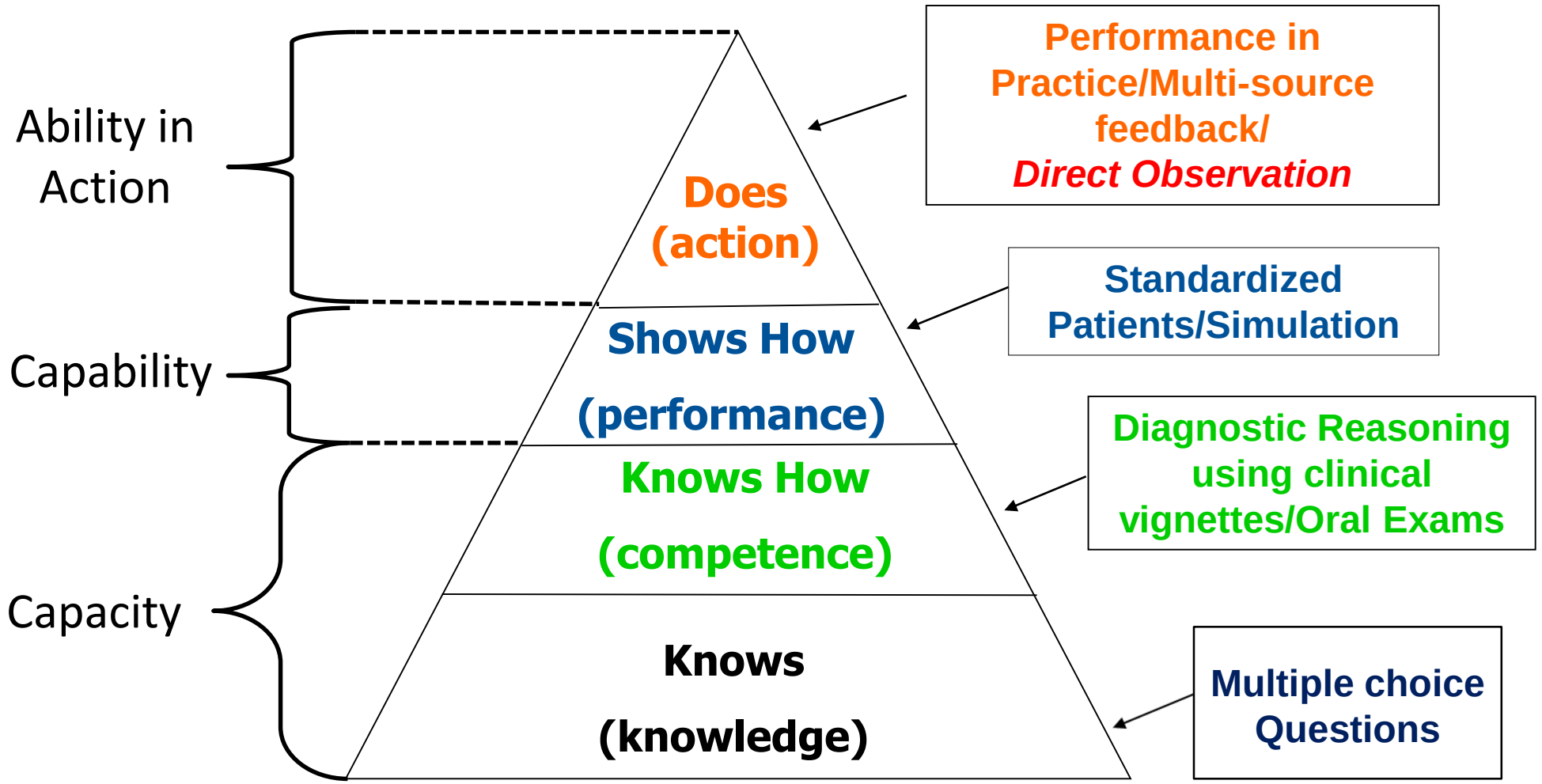
Programmatic Assessment

Programmatic Assessment

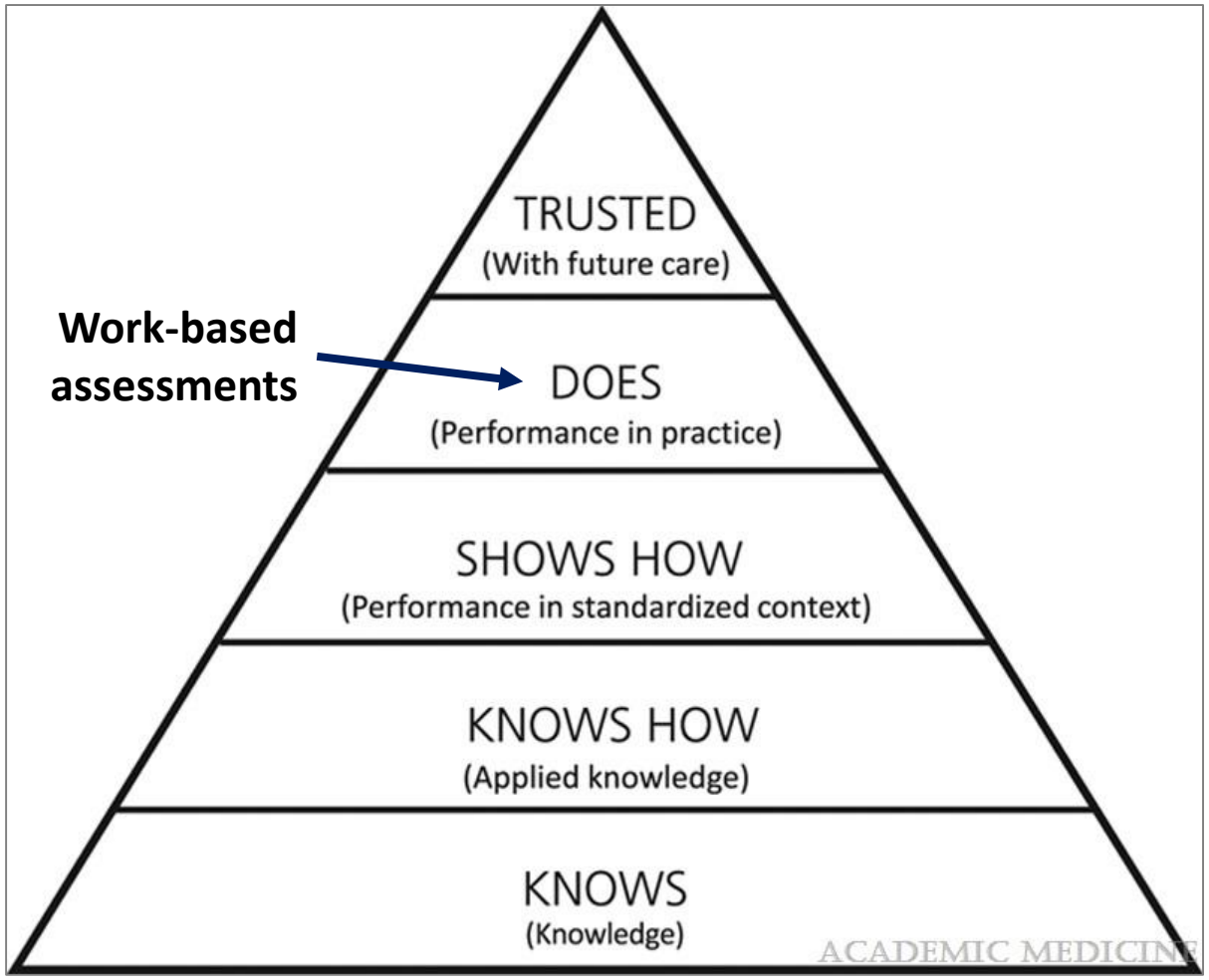
- Van der Vleuten, et. al.: “a programme of assessment [represents] an arrangement of assessment methods planned to optimise its fitness for purpose.”
  - Good assessment requires a programmatic approach in a deliberate and arranged set of longitudinal and multiple assessment activities.
  - Individual data points in the assessment programme are maximally informative to the learning.
  - Expert professional judgement in assessment is imperative and requires new approaches to deal with biases.
  - *Learners must be partners and active agents* (i.e. coproduction)

Van der Vleuten, et. al. Med Teach. 2005.

Assessing for the Desired Outcome



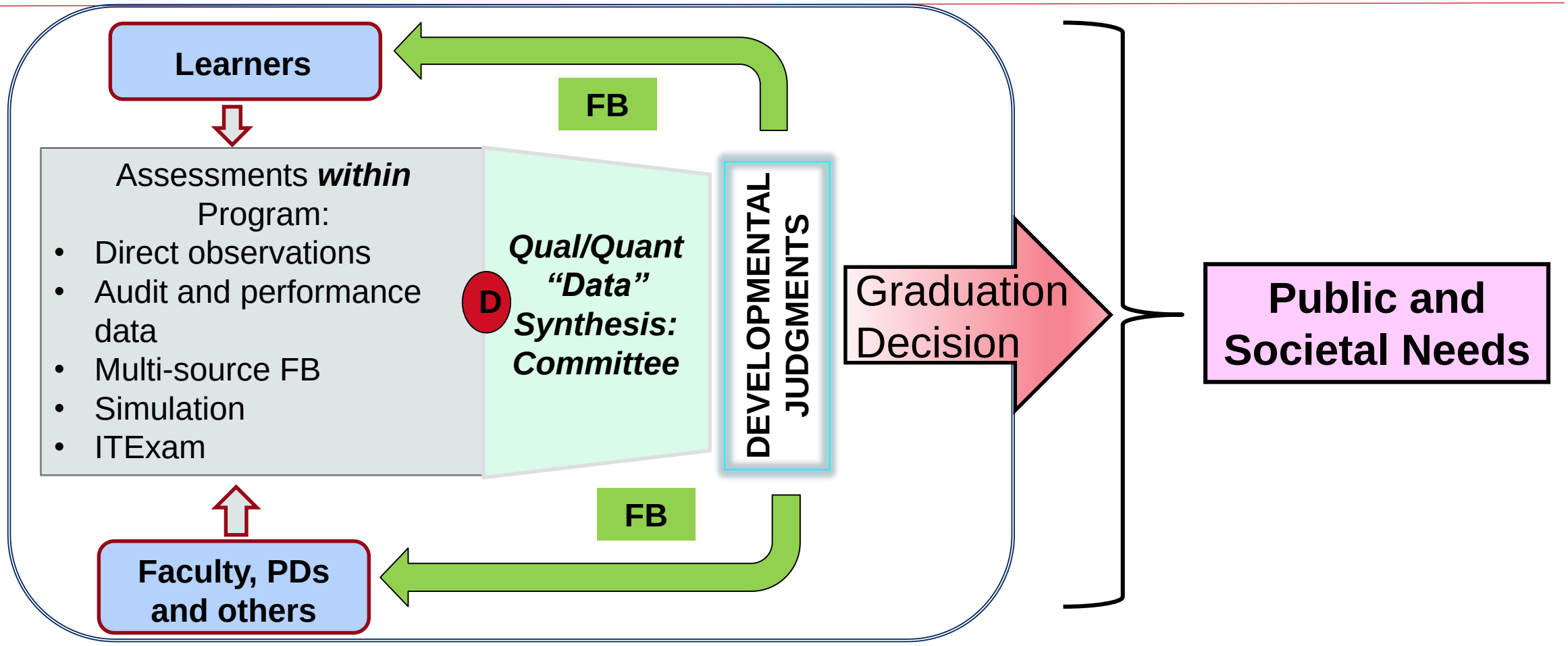
“Extended” Miller Pyramid



ten Cate, Olle; Carraccio, Carol; Damodaran, Arvin; Gofton, Wade; Hamstra, Stanley J.; Hart, Danielle E.; Richardson, Denyse; Ross, Shelley; Schultz, Karen; Warm, Eric J.; Whelan, Alison J.; Schumacher, Daniel J. **Entrustment Decision Making: Extending Miller’s Pyramid** Academic Medicine96(2):199-204, February 2021.

A new fifth level (“trusted”) reflects the process for reaching the decision to award a learner an attestation of the completion of training, leading to a medical license or specialty registration or certification, that provides permission to act unsupervised and makes the grantors cognizant of the inherent risks.

Training Program Assessment "System"



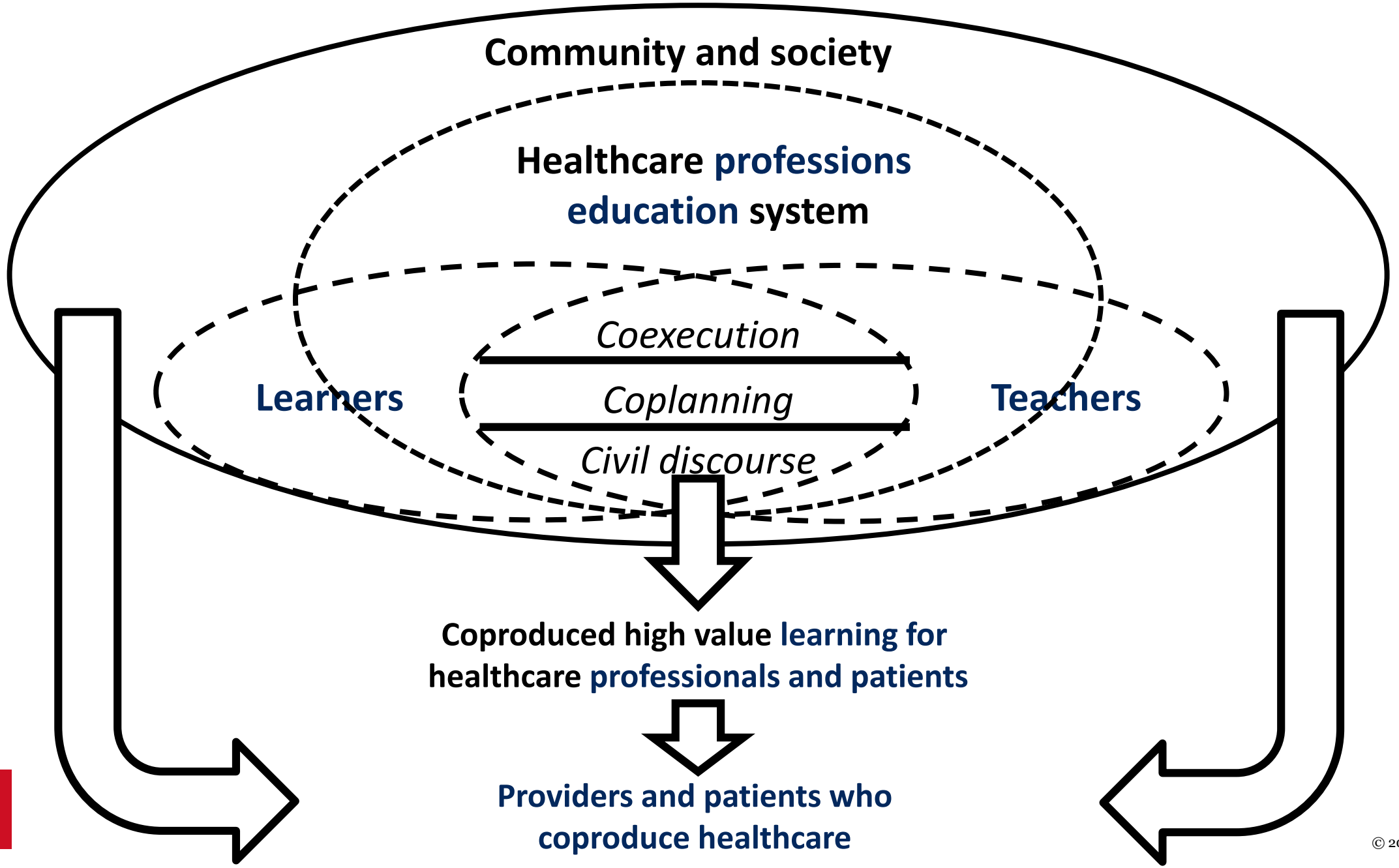
Rethinking Programmatic Assessment: Coproduction

Coproduction

P. Batalden: Co-production is *"the interdependent work of users and professionals to design, create, develop, deliver, assess and improve the relationships and actions that contribute to the health of individuals and populations."* [1]

- It is very difficult to implement a developmentally-based assessment system without substantial involvement by the learner – assessment needs to be a coproduced process

[1]From Batalden 2018; BMJ Qual Saf



Englander R, et. al. Coproducing Health Professions Education: A Prerequisite to Coproducing Health Care Services? Acad Med. 2020; in press

Coproduction Cycle: MedEd

Co-assess with feedback. How do things stand (professional development)? Were previous educational interventions effective? Are changes needed?

Co-decide on next steps, based on the learner's goals.
Compare options to make informed, preference-based educational choices.

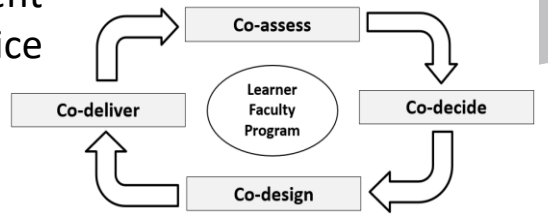
Co-design the plan to fit the learner's and program's goals, context and capabilities. Design the intervention to maximize outcomes.

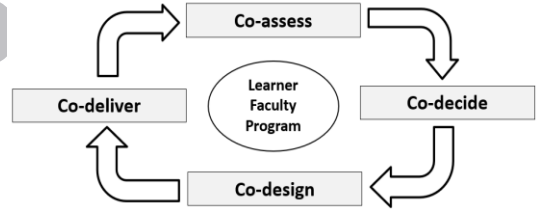
Co-deliver. How can the learner contribute? What can a medical educator or team do to support the learner?

Co-production to Support Learning Trajectories Through Effective Programmatic Assessment

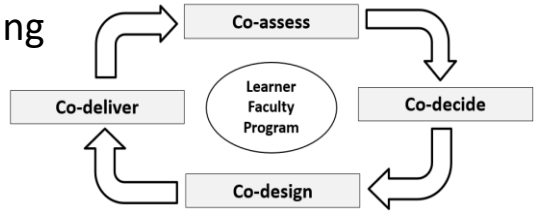
Journey to Expertise and Mastery

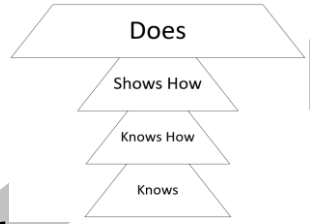
Proficient
Unsupervised Practice





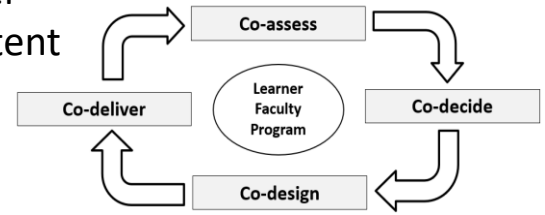
Competent within
Supervised Training

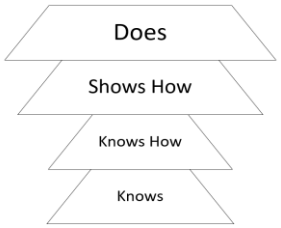




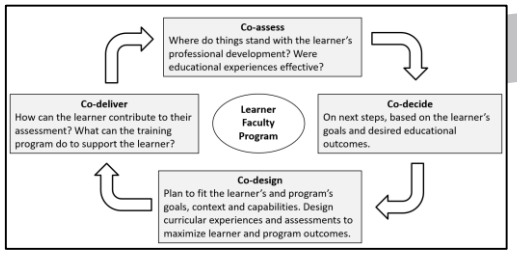
Maximize "does" assessment through ongoing reflection and professional development in practice, using other types of assessment to address competency gaps

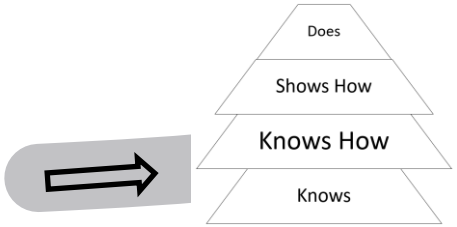
Advanced Beginner
Transition to Competent





Novice/Early Development





Programmatic Assessment that Changes and Adapts Over Time and Supports Professional Development and Identity Formation

Pair and Share

- How might you use coproduction as part of programmatic assessment in your own training program?

Conclusions

- Becoming a physician, or any health professional, is an intensely developmental process
- Assessment approaches and programs must think developmentally in their design and execution
- Expertise and mastery is the desired outcome
- Coproduction is important for developmentally-focused programmatic assessment

Questions and Discussion

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