Crossing the Synapse

Integrating Basic Science and Clinical Medicine at the Cognitive Level to Improve Medical Decision Making

Leslie H. Fall, MD
Professor of Pediatrics
Associate Dean for Faculty Development
Geisel School of Medicine at Dartmouth
MedU Executive Medical Director

CLIPP
PEDIATRIC COURSE

fmCASES
FAMILY MEDICINE COURSE

SIMPLE
INTERNAL MEDICINE COURSE

CORE
RADIOLOGY COURSE

WISE-MD
SURGICAL MODULES

MedU

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SIMPLE
INTERNAL MEDICINE COURSE

CORE
RADIOLOGY COURSE

WISE-MD
SURGICAL MODULES

IAMSE

MedU Science

Coming Soon!

MedU Science

A NEW virtual patient course integrating core basic science concepts into the clinical training–focused years.

Pilot July 2015

Available by subscription in 2016

Meet the team!

www.med-u.org/medu-science

MedU + IAMSE = MedU Science

- Clinical application of core basic science concepts
- Improved clinical care through basic science understanding
- Student self assessment of basic science knowledge
- Educator tools for integrated teaching sessions
- Mobile tools for bedside teaching and learning

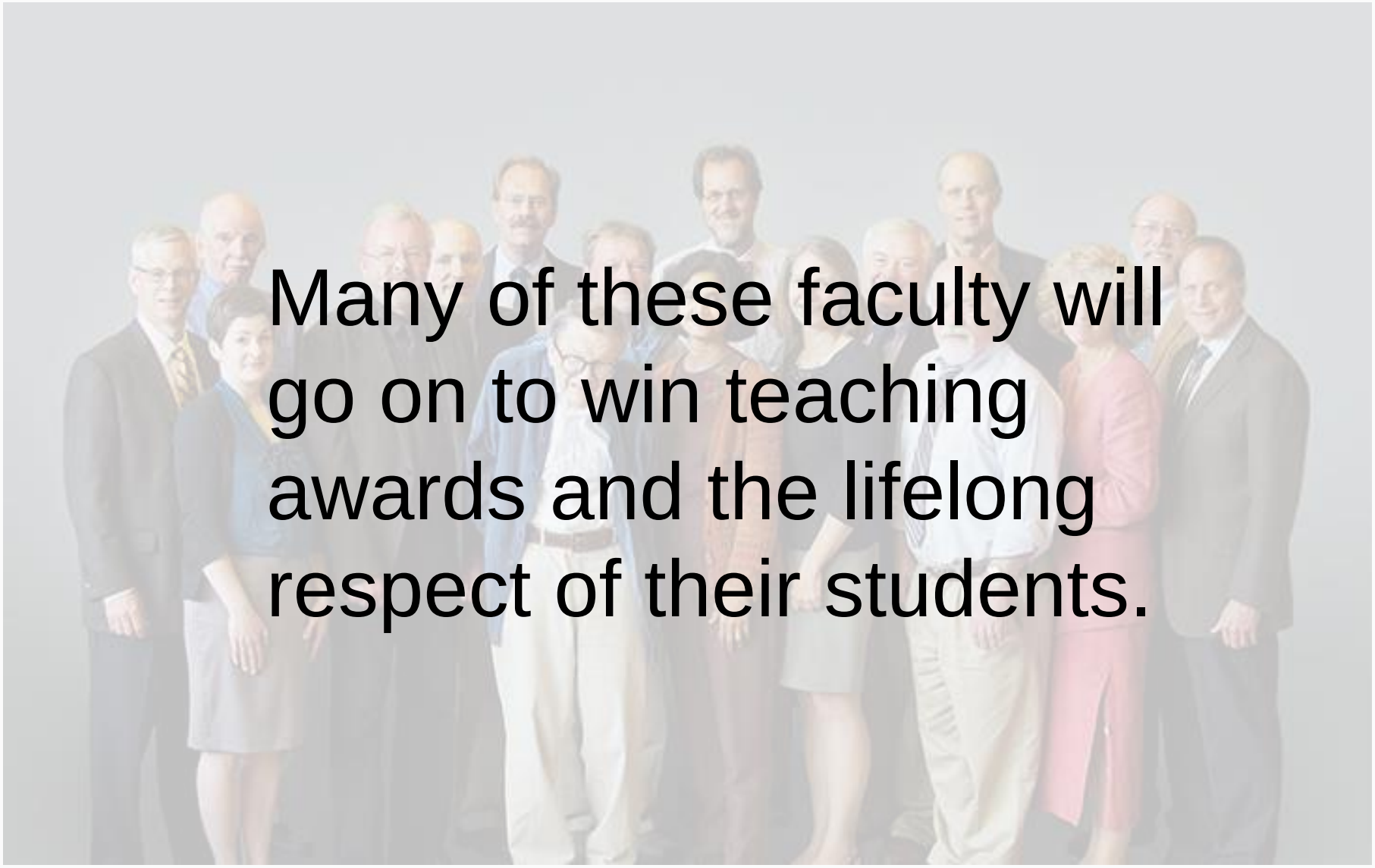
MedU

In collaboration with the International Association of Medical Science Educators

IAMSE

Visit us at: www.med-u.org

Faculty spend over 1200 hours teaching basic sciences in the average medical school curriculum.



Many of these faculty will go on to win teaching awards and the lifelong respect of their students.

So why are medical students persistently told by clinicians that they will use little of their basic science education in practice?

17th Annual Meeting

St. Andrews, Scotland, UK June 8-11, 2013

Science education for health care professionals across the continuum

Join us for the IAMSE conference on Medical Science Education!

At the annual meeting of the International Association of Medical Science Educators (IAMSE) faculty, staff and students from around the world who are interested in medical science education join together in faculty development and networking opportunities. Sessions on curriculum development, assessment and simulation are among the common topics available at the annual meetings. This meeting is co-sponsored by the Association for Medical Education in Europe (AMEE)

18th Annual Meeting

Nashville, Tennessee, USA June 7-10, 2014

Onsite registration will be available!

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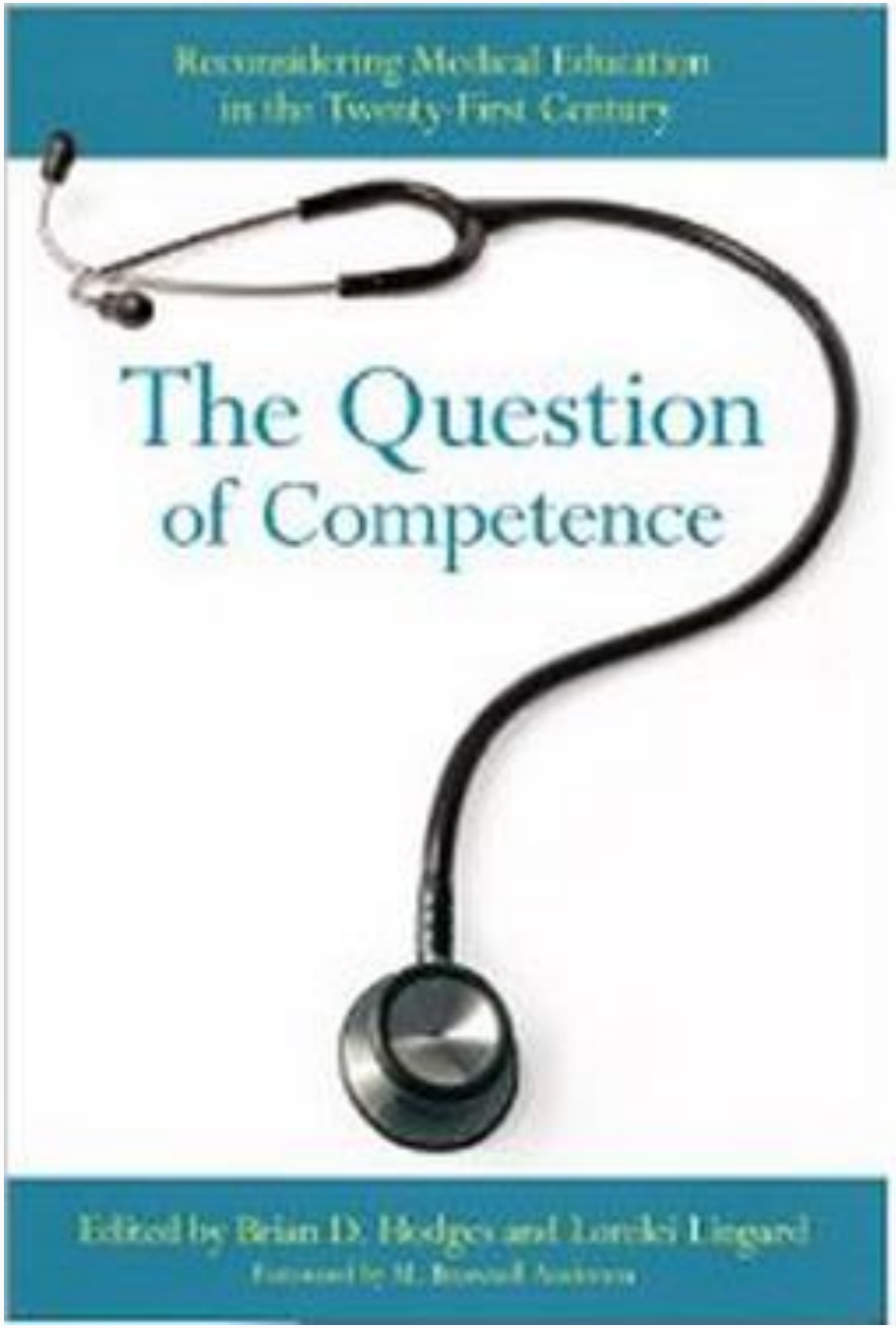
IAMSE

Integration Matters: A case for the integration of basic and clinical sciences.

Nicole N. Woods, University of Toronto

Over the past 100 years, it has become standard for medical training to include both the clinical and basic biomedical sciences. However, the precise role of basic science knowledge in clinical practice and the most appropriate place for basic science training in the curriculum remain contentious issues. Recent research in education suggests that the inclusion of basic science instruction in undergraduate training is not only important in it's own right but can also complement and aid development of clinical knowledge. Basic science teaching at many institutions worldwide is often sequestered or separated from clinical knowledge. Basic science courses tend to be confined to the first two years of undergraduate training with few attempts to include basic science content during the clerkship years. Though this approach intends to give both domains adequate coverage, presenting basic science separately from clinical knowledge may de-contextualize the former. In response, education researchers have renewed calls for the "integration" of basic science and clinical instruction. However, definitions of integration vary greatly and there remains little evidence to support the value of integration in any form. Experimental studies of memory and learning will be used to advance our understanding of the contribution of basic science knowledge to the mental representation of disease; creating a case for the "cognitive integration" of basic and clinical sciences in health professions education.

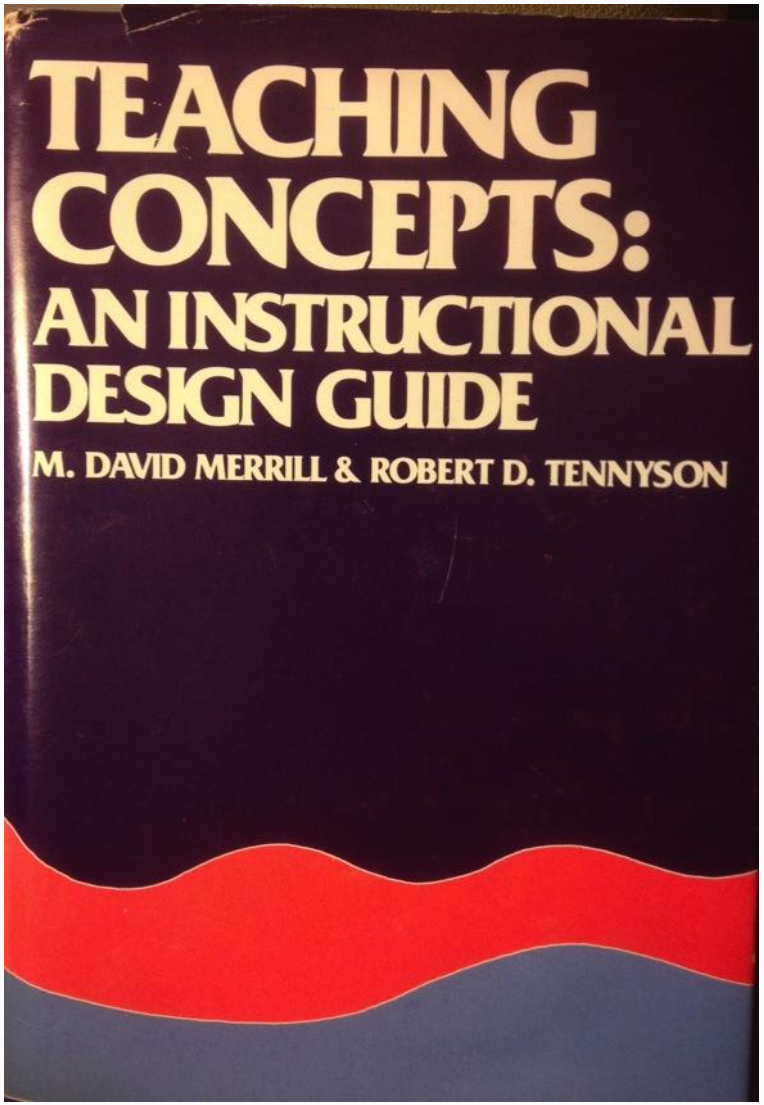


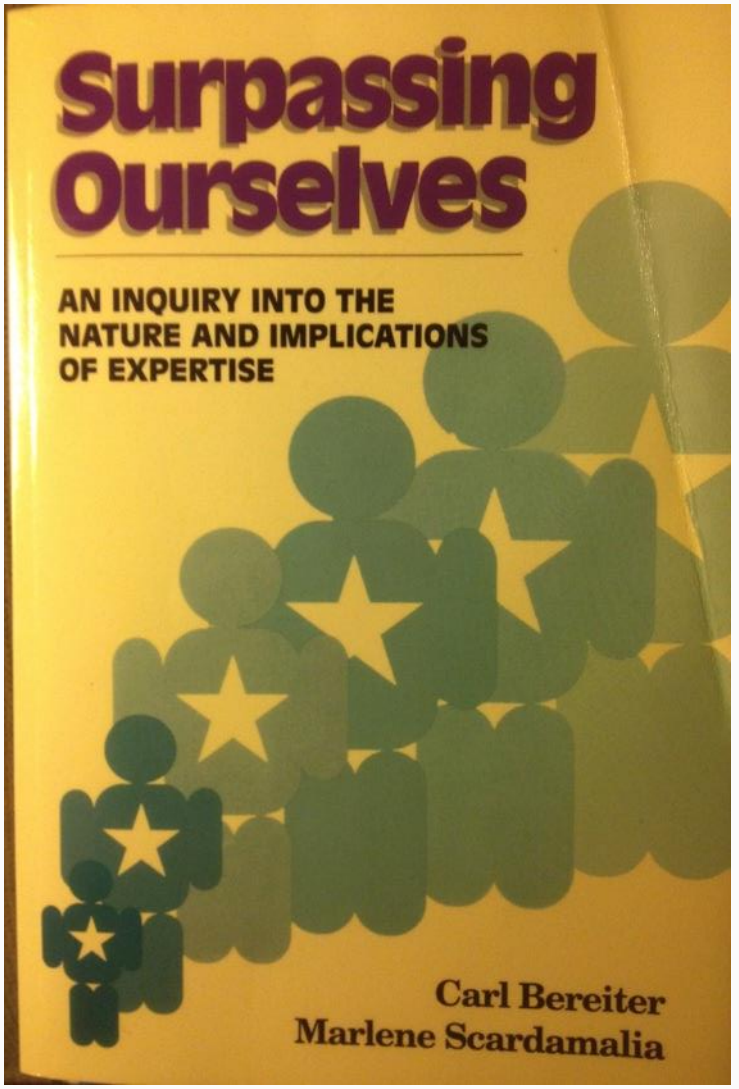
4. Competence as Expertise: Exploring Constructions of Knowledge in Expert Practice

- ***Maria Mylopoulos***

7. The Competent Mind: Beyond Cognition

- Annie S. O. Leung, Ronald M. Epstein, and Carol-Anne E. Moulton

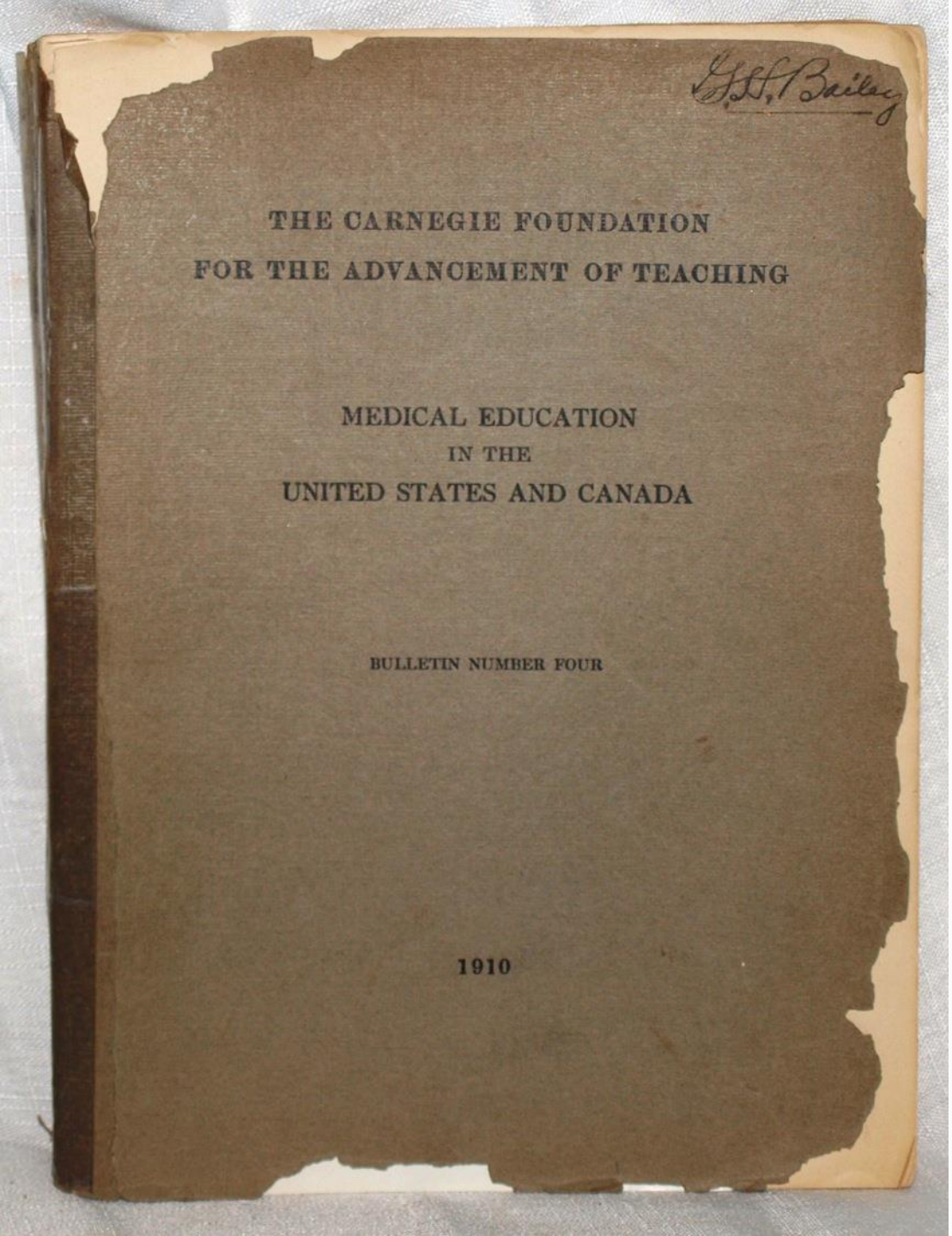

TEACHING CONCEPTS:
AN INSTRUCTIONAL DESIGN GUIDE
M. DAVID MERRILL & ROBERT D. TENNYSON


Surpassing Ourselves
AN INQUIRY INTO THE NATURE AND IMPLICATIONS OF EXPERTISE
Carl Bereiter
Marlene Scardamalia


LCME
Frontiers

Why are the basic sciences important to the practice of clinical medicine?


I have congestive heart failure with poor liver & renal function.
Her humours are imbalanced. Shall I prescribe a tonic?



Train physicians to practice with a scientific understandin g of human anatomy and physiology, employing faculty engaged in medical

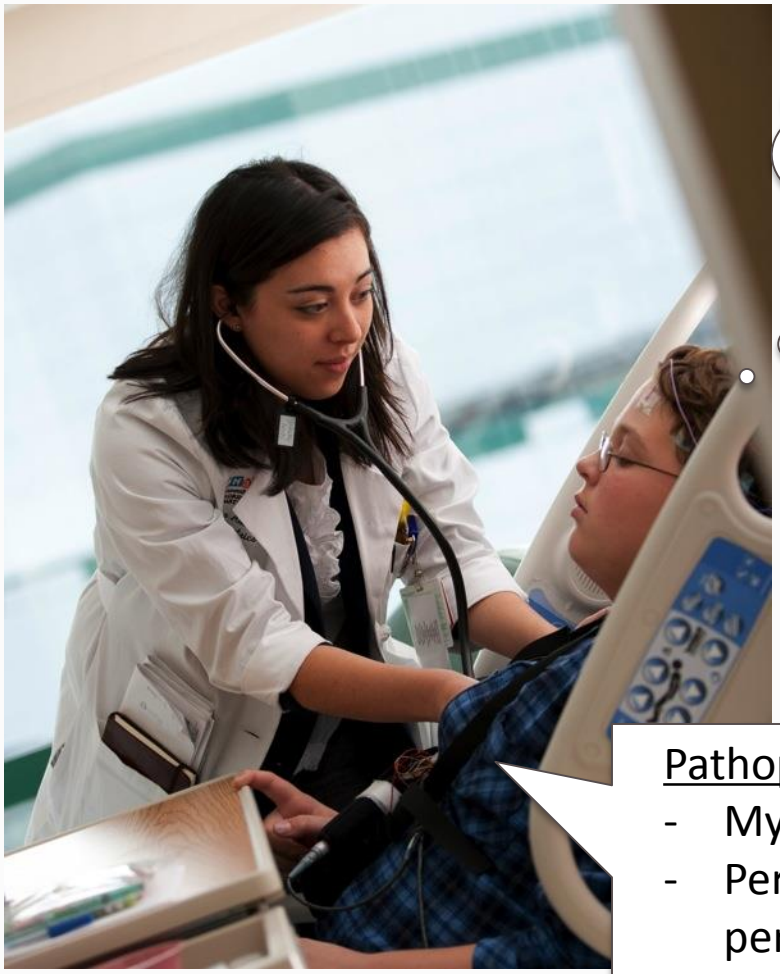

My tuberculosis is worsening and I am malnourished.
His lungs are filled with fluid. Does he need more fresh air?

Why are the basic sciences important to the practice of clinical medicine *today*?

Why are the basic sciences important to the practice of clinical medicine *today*?

Why are the basic sciences important to the practice of clinical medicine *today*?

Causal Reasoning



I have congestive heart failure with poor liver & renal function.

Pathophysiology
- Myocardial function
- Peripheral vascular permeability
- Glomerular function
- Albumin synthesis

How can we better integrate basic science understanding into clinical learning?

Perspective: **Deconstructing Integration: A Framework for the Rational Application of Integration as a Guiding Curricular Strategy**

Ellen Goldman, EdD, and W. Scott Schroth, MD, MPH

Abstract

In response to historical criticism, evolving accreditation standards, and recent reports on curricula, medical educators and medical schools have been eagerly pursuing integration as a goal of curricular reform. The general education literature broadly considers integration to be the deliberate unification of separate areas of knowledge, and it provides support for the concept that integration better meets the needs of adult learners in professional education.

The use of integration as a curricular goal is not without its critics, however, nor is it free of difficulties in implementation. In this perspective, the authors propose that most of these difficulties arise from a failure to recognize that integration is a strategy for curricular development rather than a goal in itself, and they argue that adopting a systematic approach to integration offers many potential benefits. They articulate the conceptual and practical issues that they believe are critical to consider in order to achieve successful curricular integration, and they suggest that integration should be approached as a subset of broader curriculum development decisions. They propose a three-level framework for applying integration as a guiding curricular strategy, in which decisions about integration must follow curricular decisions made at the program level, the course level, and then the individual session level.

Academic Medicine, Vol. 87, No. 6 / June 2012

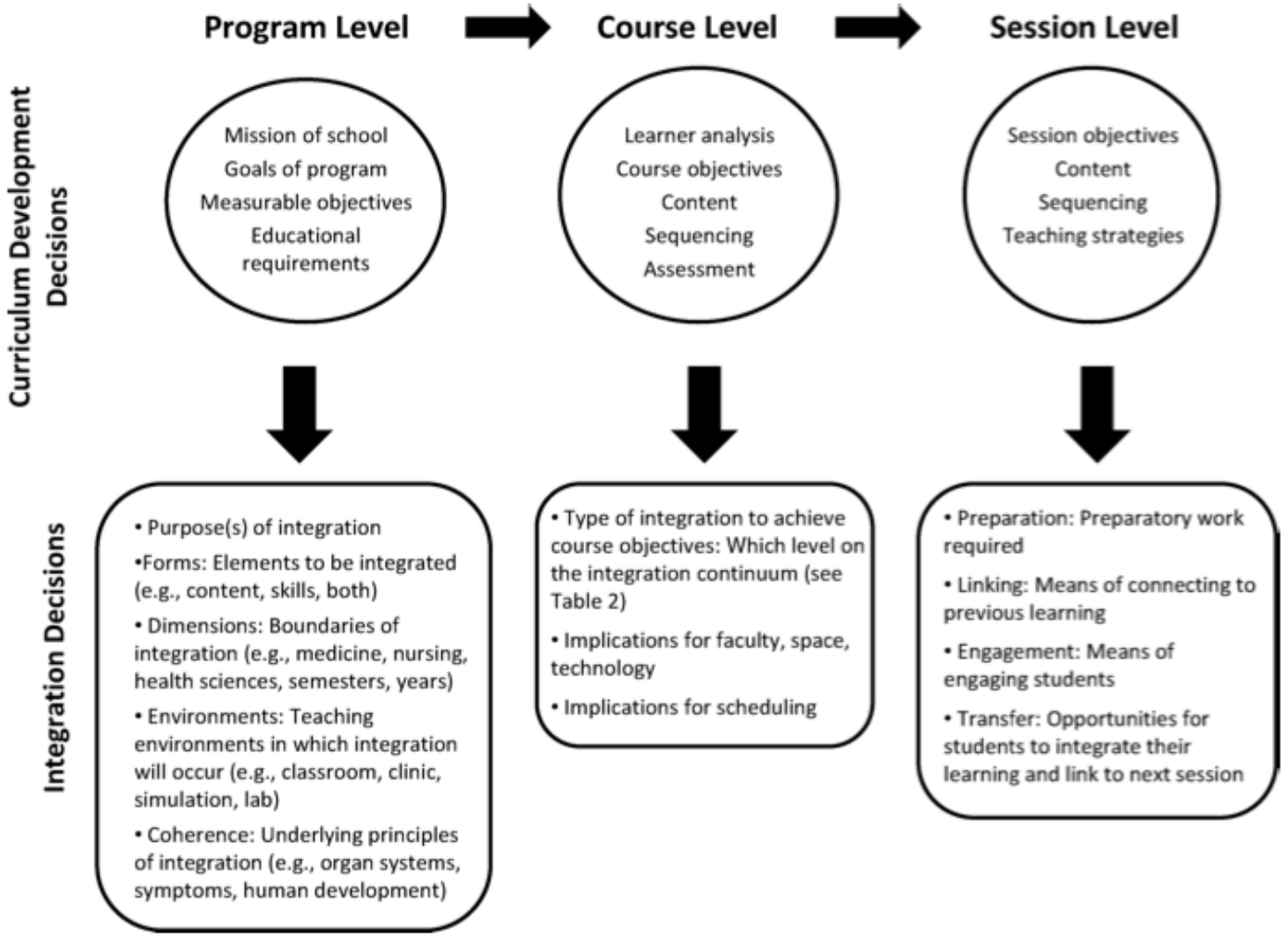
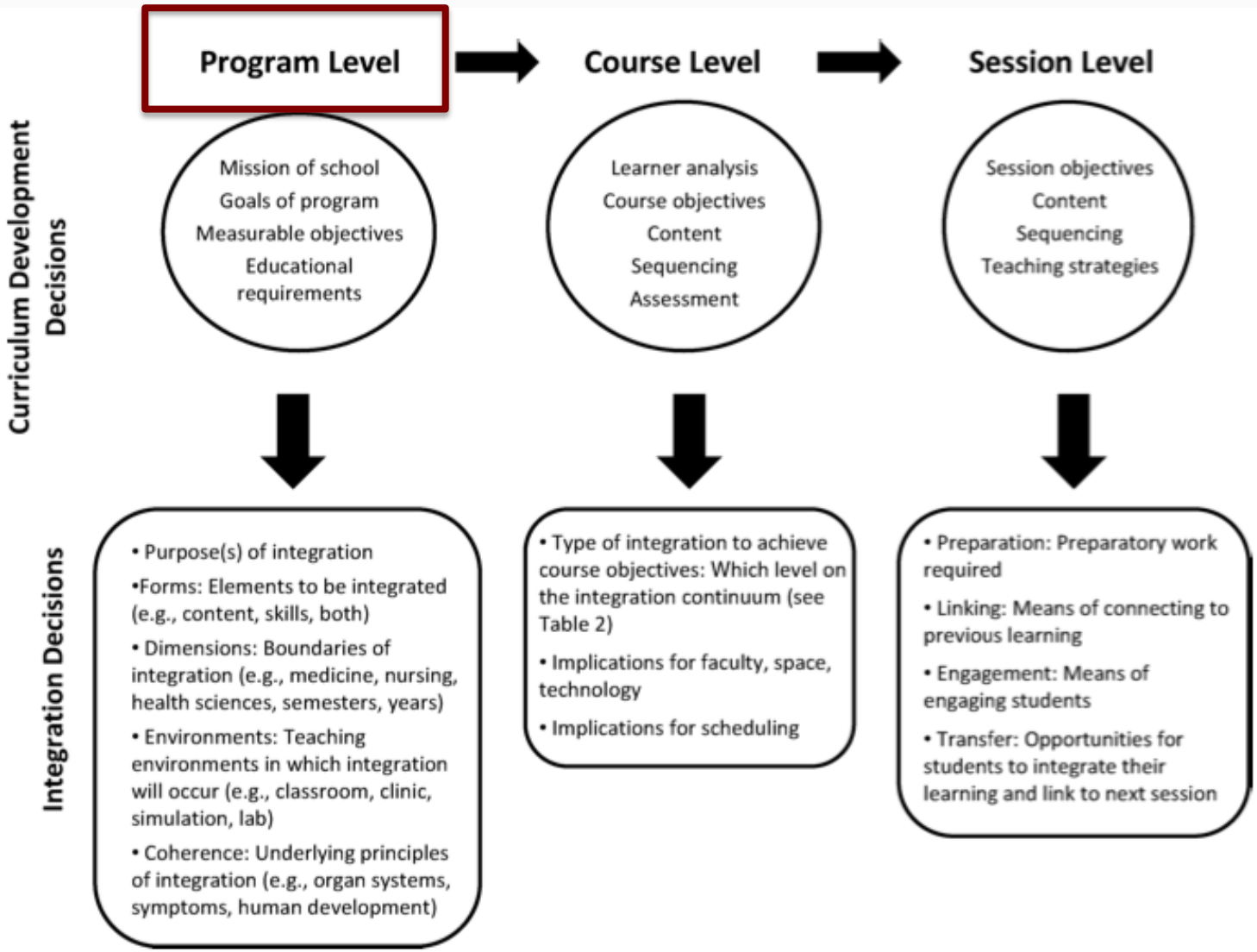


Figure 1 Organizing framework for curriculum development and required integration decisions at the program, course, and session levels of curricular design.



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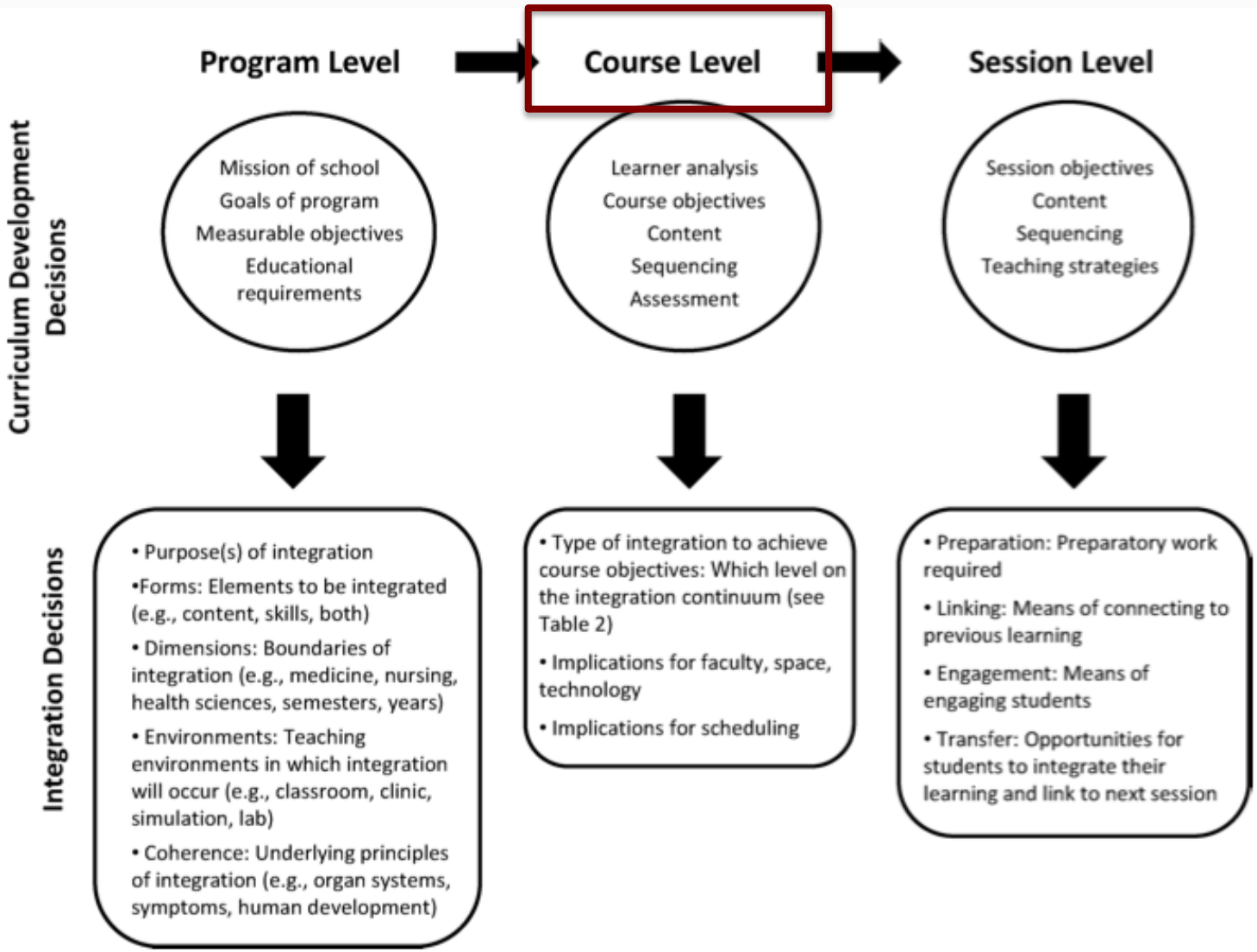

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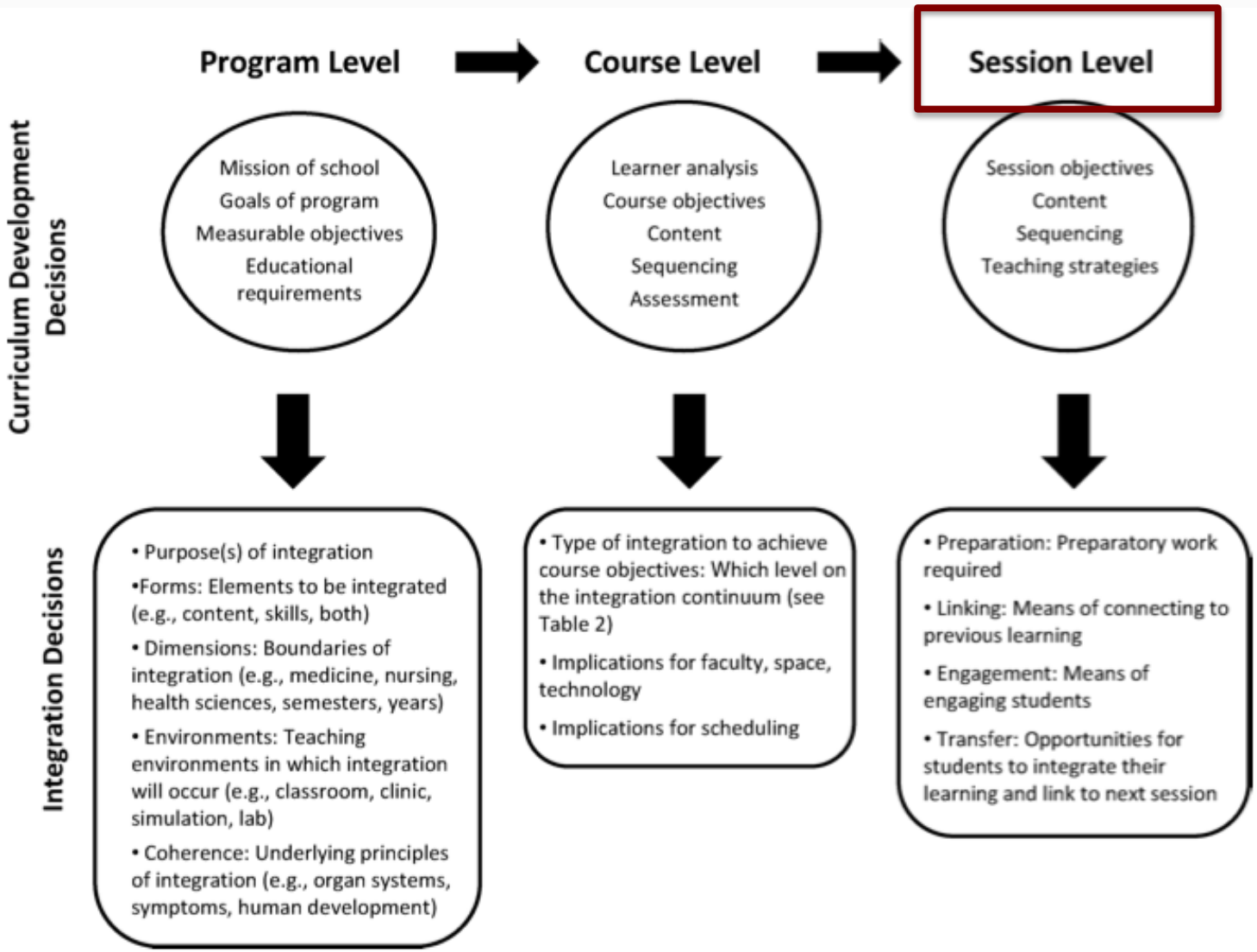

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Contextual Integration

http://portals.clevelandclinic.org/cclcm/Academics/Problem-basedLearning/tabid/7615/Default.aspx

What are we missing?

Integration begins here . . .

I have congestive heart failure with poor liver & renal function.

Biologic Integration

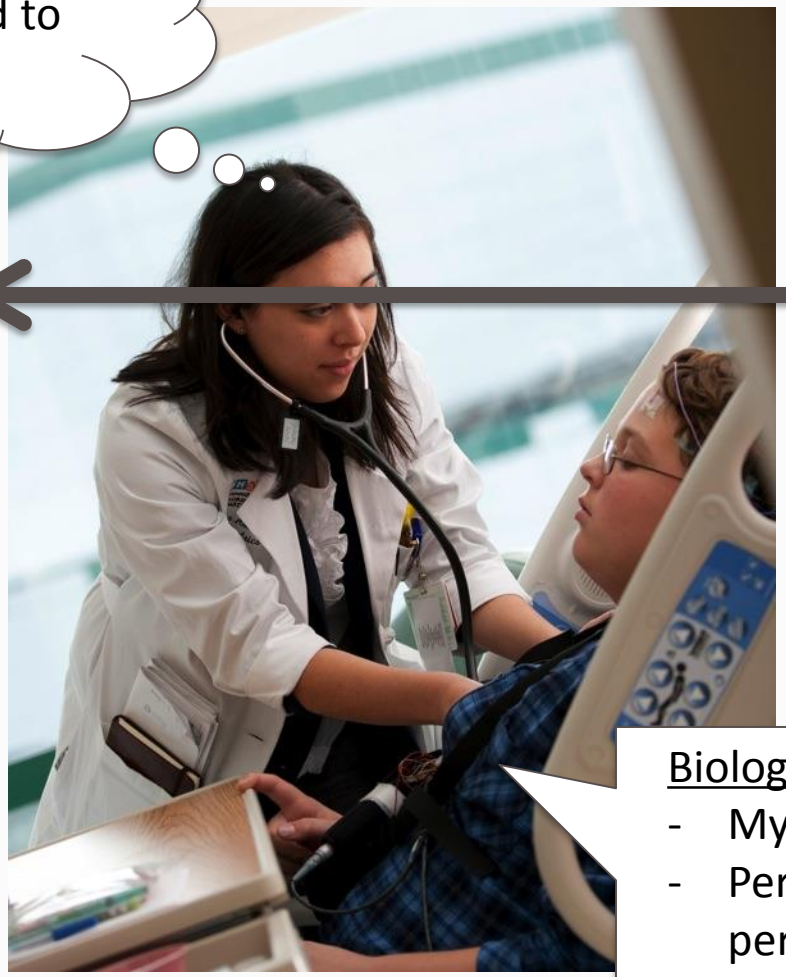
- Myocardial function
- Peripheral vascular permeability
- Glomerular function
- Albumin synthesis

Clinical competency begins here . . .

Does she need to be diuresed?

Clinical competency begins here . . .

Does she need to be diuresed?



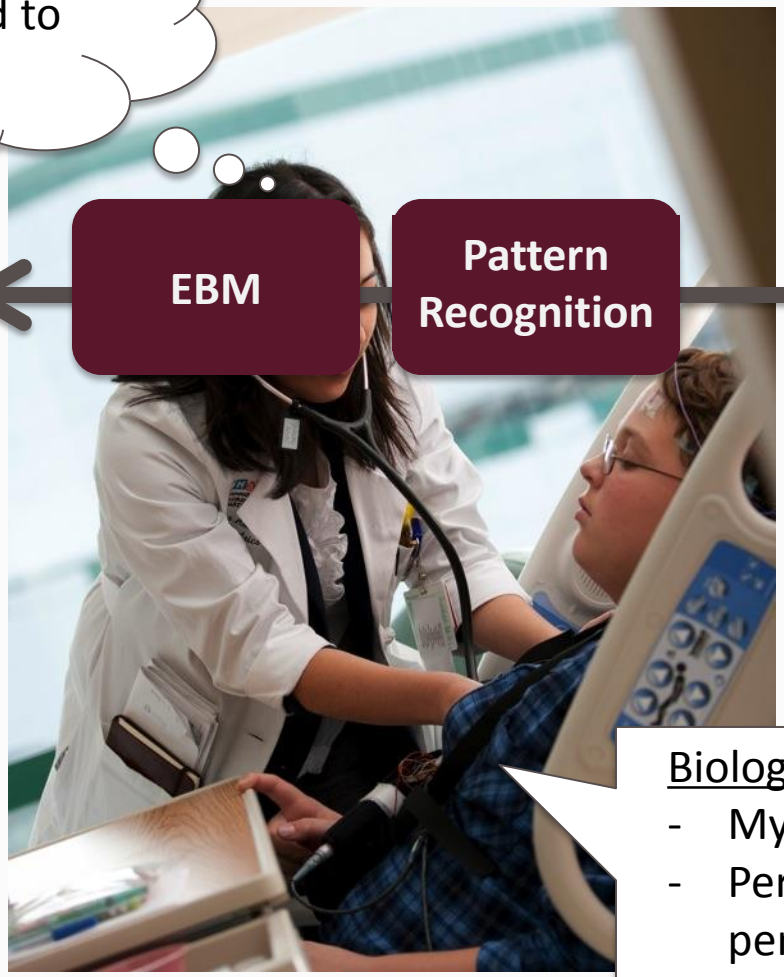
Findings
- SOB
- Tachycardia
- Hypertension
- Urine output
- Albumin levels

Signs & Symptoms
- SOB
- Tachycardia
- Hypertension
- Urine output
- Albumin levels

Biologic Integration
- Myocardial function
- Peripheral vascular permeability
- Glomerular function
- Albumin synthesis

With these tools to help . . .

Does she need to be diuresed?



EBM

Pattern Recognition

<u>Findings</u>
- SOB
- Tachycardia
- Hypertension
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- Albumin levels

<u>Signs & Symptoms</u>
- SOB
- Tachycardia
- Hypertension
- Urine output
- Albumin levels

<u>Biologic Integration</u>
- Myocardial function
- Peripheral vascular permeability
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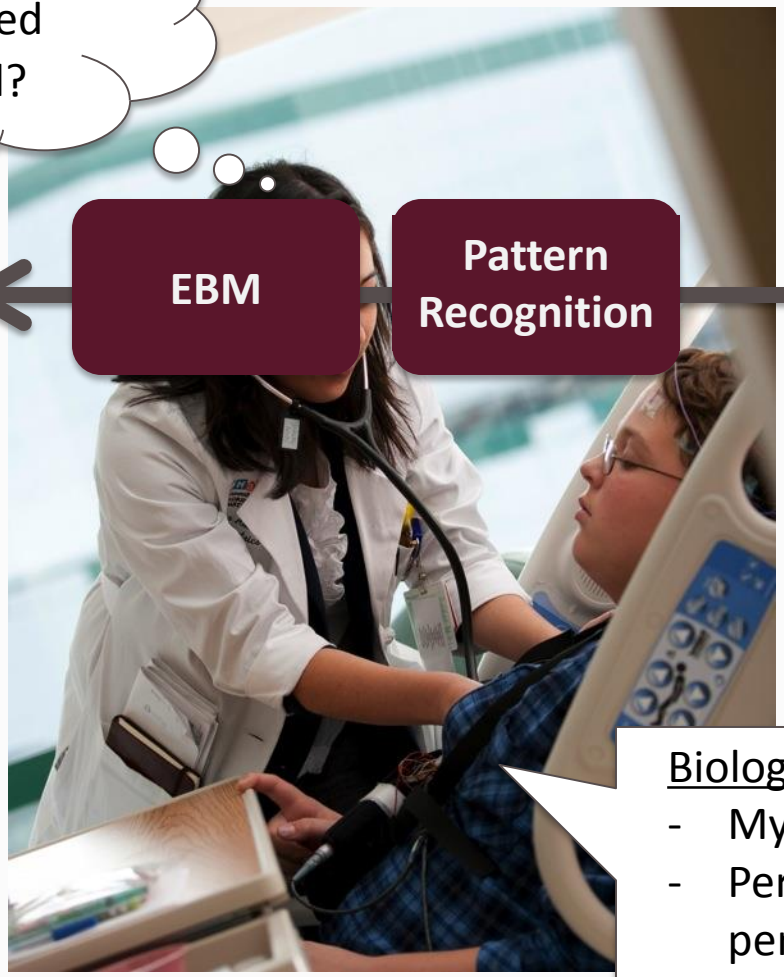
- Albumin synthesis

But is that all there is to clinical excellence?

Does **SHE** need to be diuresed?



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The Answer: Excellence in Patient Care

It is in the application of principles to individual patients, in the individuality of each clinical decision-making situation, that an understanding of science is essential and takes precedence over pattern recognition and protocols.

Adapted from Lou Pangaro (JIAMSE 2010)

Cognition Before Curriculum: Rethinking the Integration of Basic Science and Clinical Learning

Kulamakan Mahan Kulasegaram, Maria Athina Martimianakis, PhD, Maria Mylopoulos, PhD, Cynthia R. Whitehead, MD, PhD, and Nicole N. Woods, PhD

Abstract

Purpose
Integrating basic science and clinical concepts in the undergraduate medical curriculum is an important challenge for medical education. The health professions education literature includes a variety of educational strategies for integrating basic science and clinical concepts at multiple levels of the curriculum. To date, assessment of this literature has been limited.

Method
In this critical narrative review, the authors analyzed literature published in the last 30 years (1982–2012) using a previously published integration framework. They included studies that documented approaches to integration at the level of programs, courses, or teaching sessions and that aimed to improve learning outcomes. The authors evaluated these studies for evidence of successful integration and to identify factors that contribute to integration.

Results
Several strategies at the program and course level are well described but poorly evaluated. Multiple factors contribute to successful learning, so identifying how interventions at these levels result in successful integration is difficult. Evidence from session-level interventions and experimental studies suggests that integration can be achieved if learning interventions attempt to link basic and clinical science in a causal relationship. These interventions attend to how learners connect different domains of knowledge and suggest that successful integration requires learners to build cognitive associations between basic and clinical science.

Conclusions
One way of understanding the integration of basic and clinical science is as a cognitive activity occurring within learners. This perspective suggests that learner-centered, content-focused, and session-level-oriented strategies can achieve cognitive integration.

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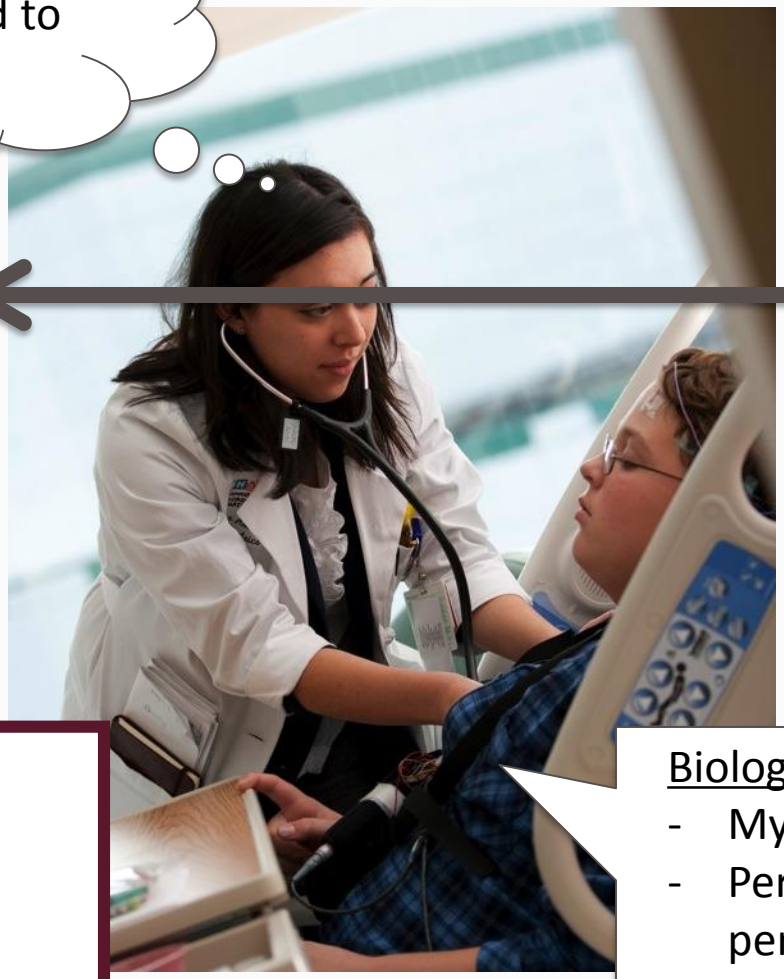
Integration happens here!

Does she need to be diuresed?



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- Tachycardia
- Hypertension
- Urine output
- Albumin levels

Signs & Symptoms
- SOB
- Tachycardia
- Hypertension
- Urine output
- Albumin levels

Cognitive integration
- Myocardial function
- Peripheral vascular permeability
- Glomerular function
- Albumin synthesis

Biologic Integration
- Myocardial function
- Peripheral vascular permeability
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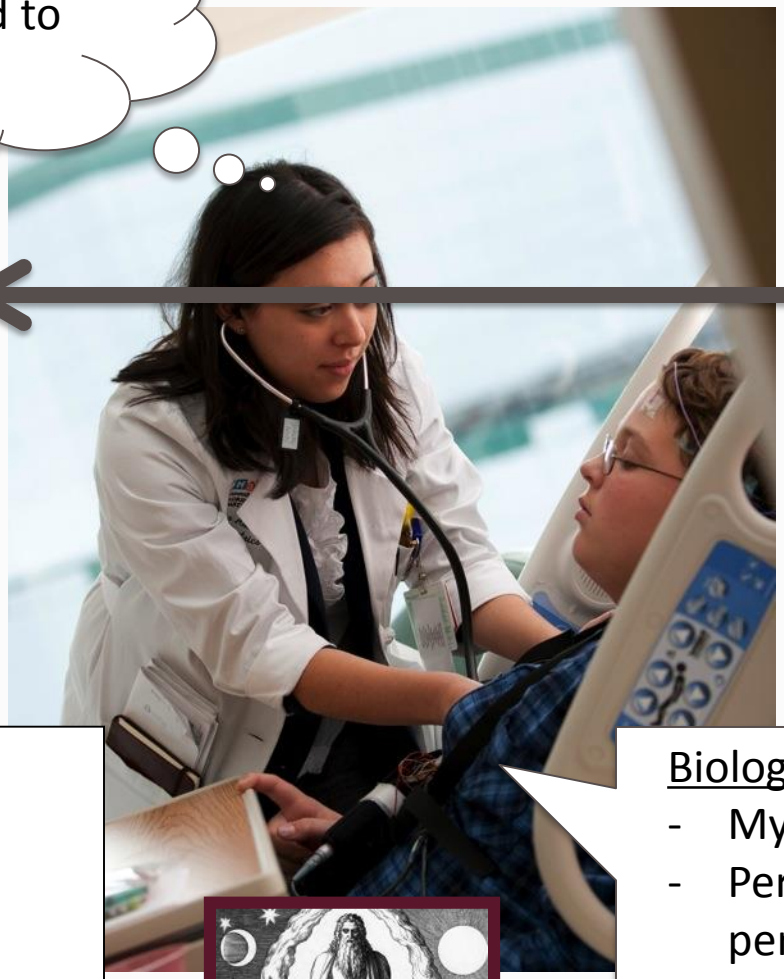
and the ultimate goal is omniscience ☺

Does she need to be diuresed?



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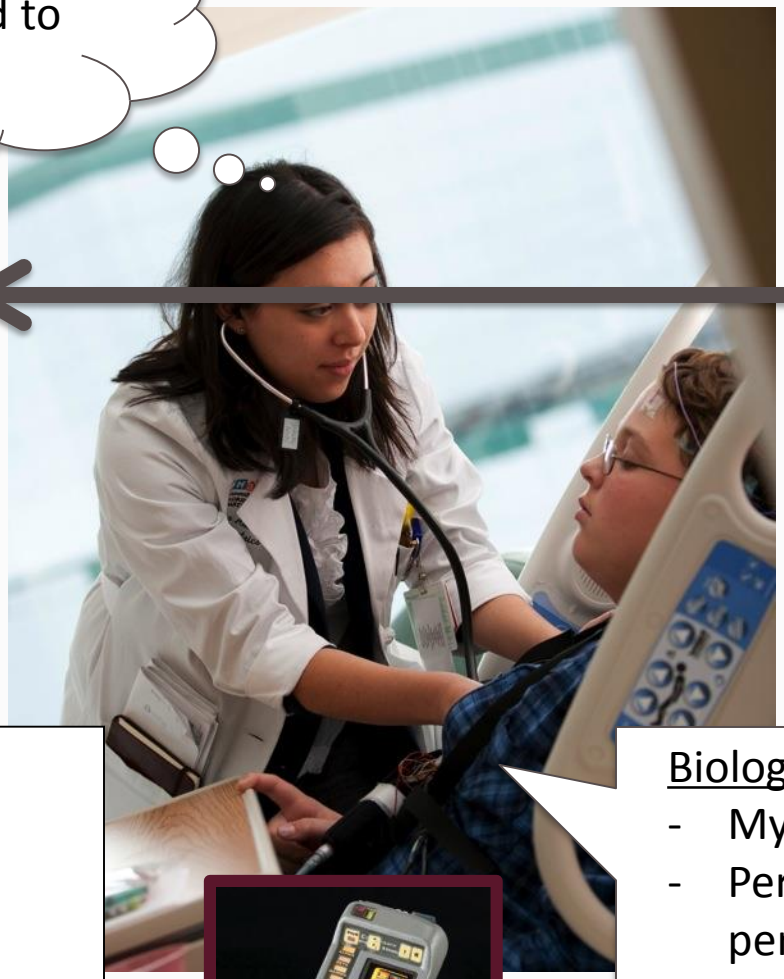
- Albumin synthesis

What tools have we given her to help with cognitive integration?

No tricorders (yet) . . .

Does she need to be diuresed?



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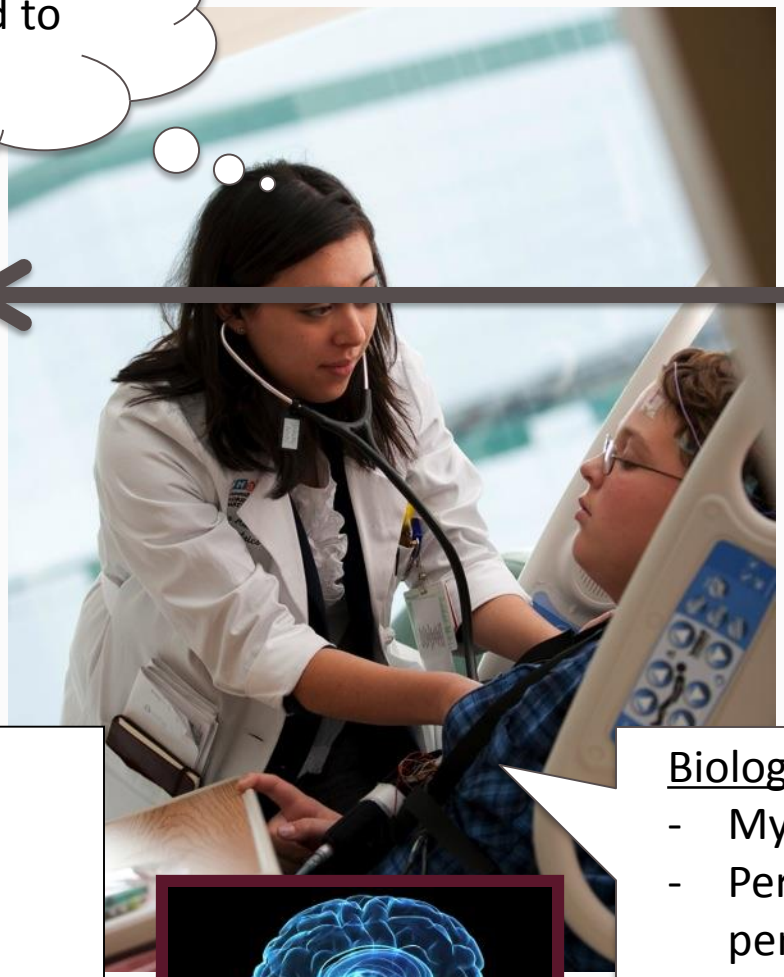
But we have something better . . .

Does she need to be diuresed?



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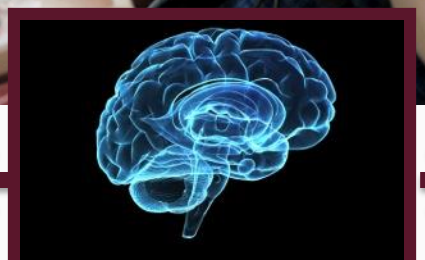

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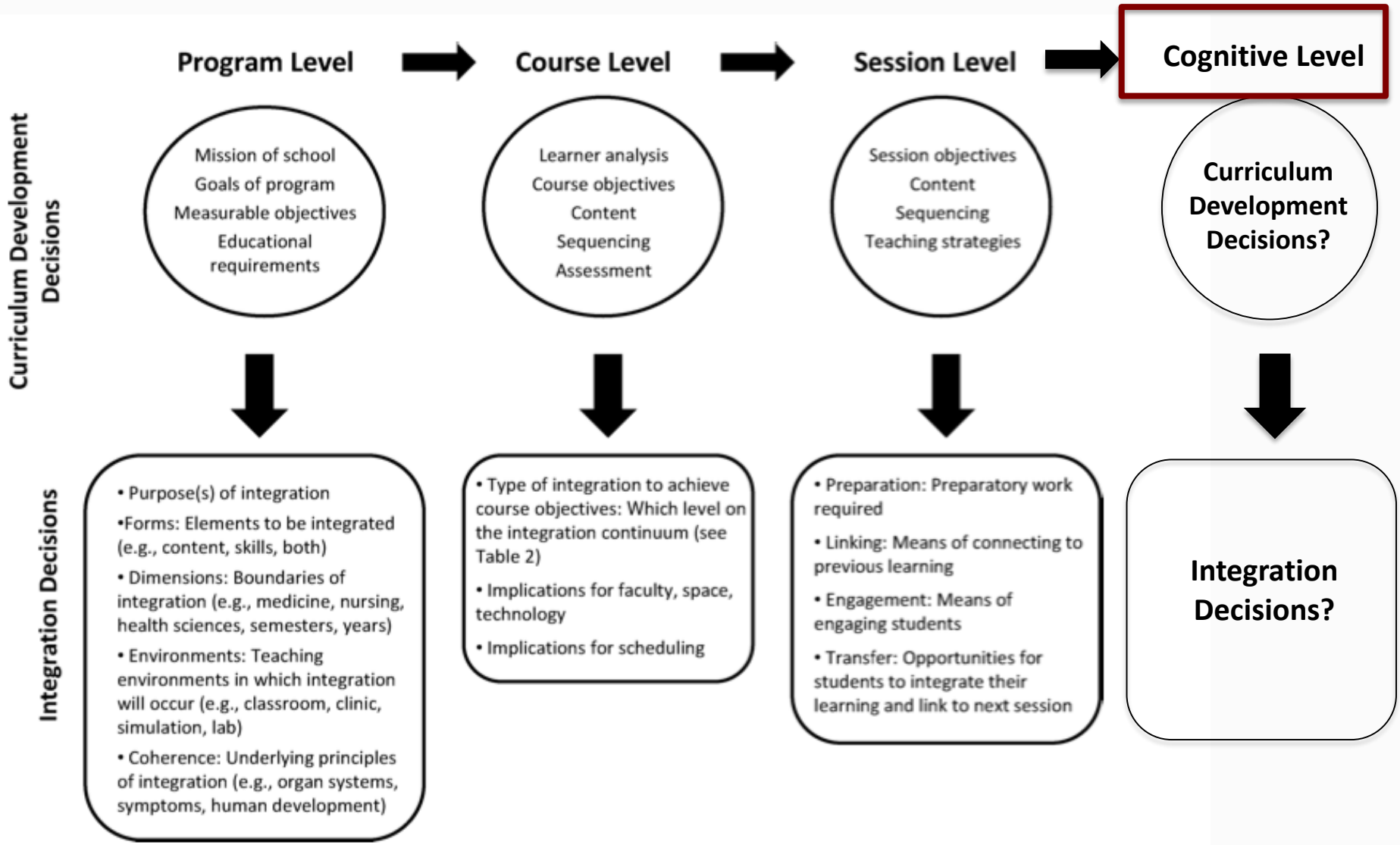
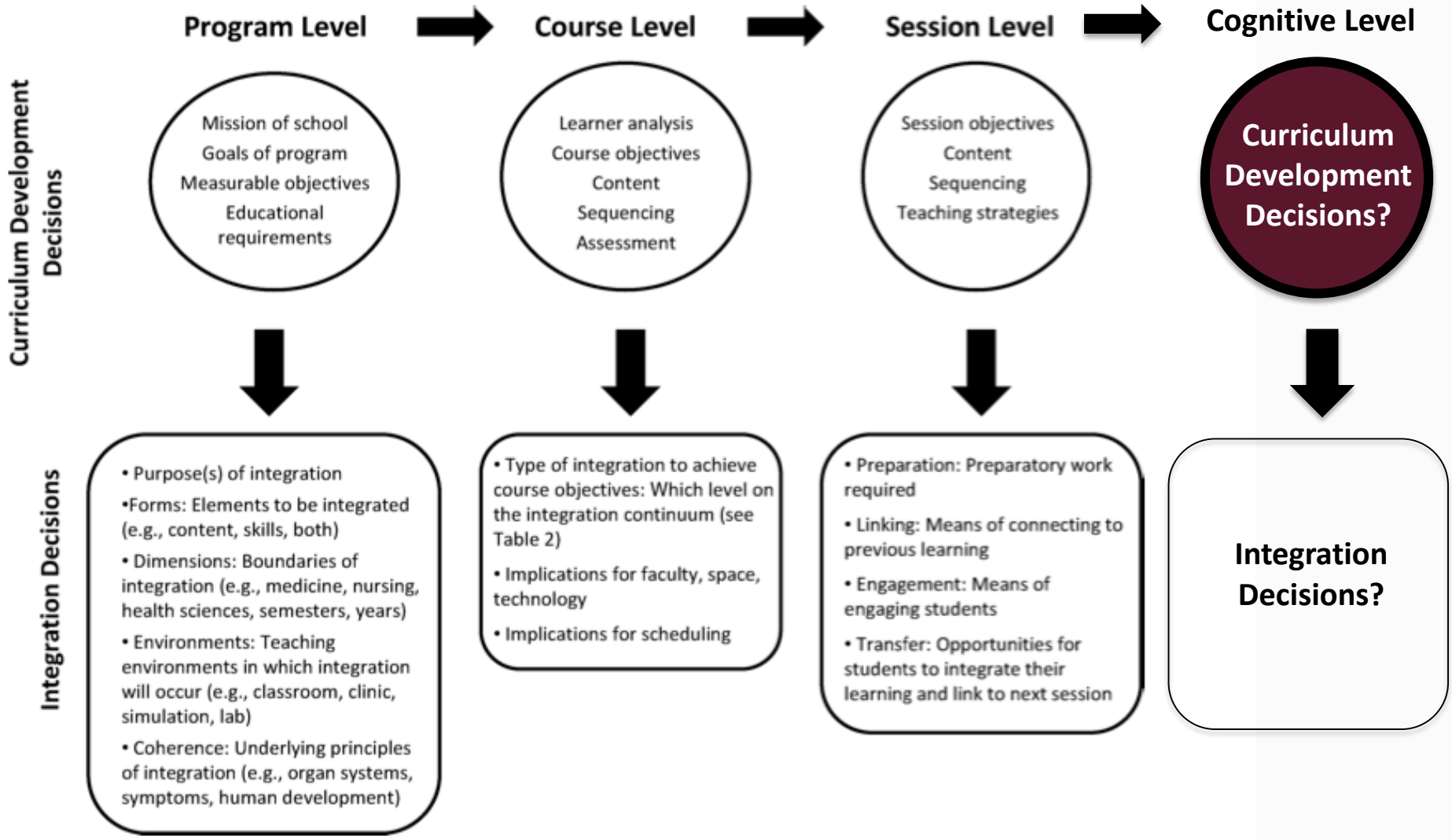

Program Level
Course Level
Session Level
Cognitive Level
Curriculum Development Decisions
Mission of school
Goals of program
Measurable objectives
Educational requirements
Learner analysis
Course objectives
Content
Sequencing
Assessment
Session objectives
Content
Sequencing
Teaching strategies
Curriculum Development Decisions?
Integration Decisions
• Purpose(s) of integration
•Forms: Elements to be integrated (e.g., content, skills, both)
• Dimensions: Boundaries of integration (e.g., medicine, nursing, health sciences, semesters, years)
• Environments: Teaching environments in which integration will occur (e.g., classroom, clinic, simulation, lab)
• Coherence: Underlying principles of integration (e.g., organ systems, symptoms, human development)
• Type of integration to achieve course objectives: Which level on the integration continuum (see Table 2)
• Implications for faculty, space, technology
• Implications for scheduling
• Preparation: Preparatory work required
• Linking: Means of connecting to previous learning
• Engagement: Means of engaging students
• Transfer: Opportunities for students to integrate their learning and link to next session
Integration Decisions?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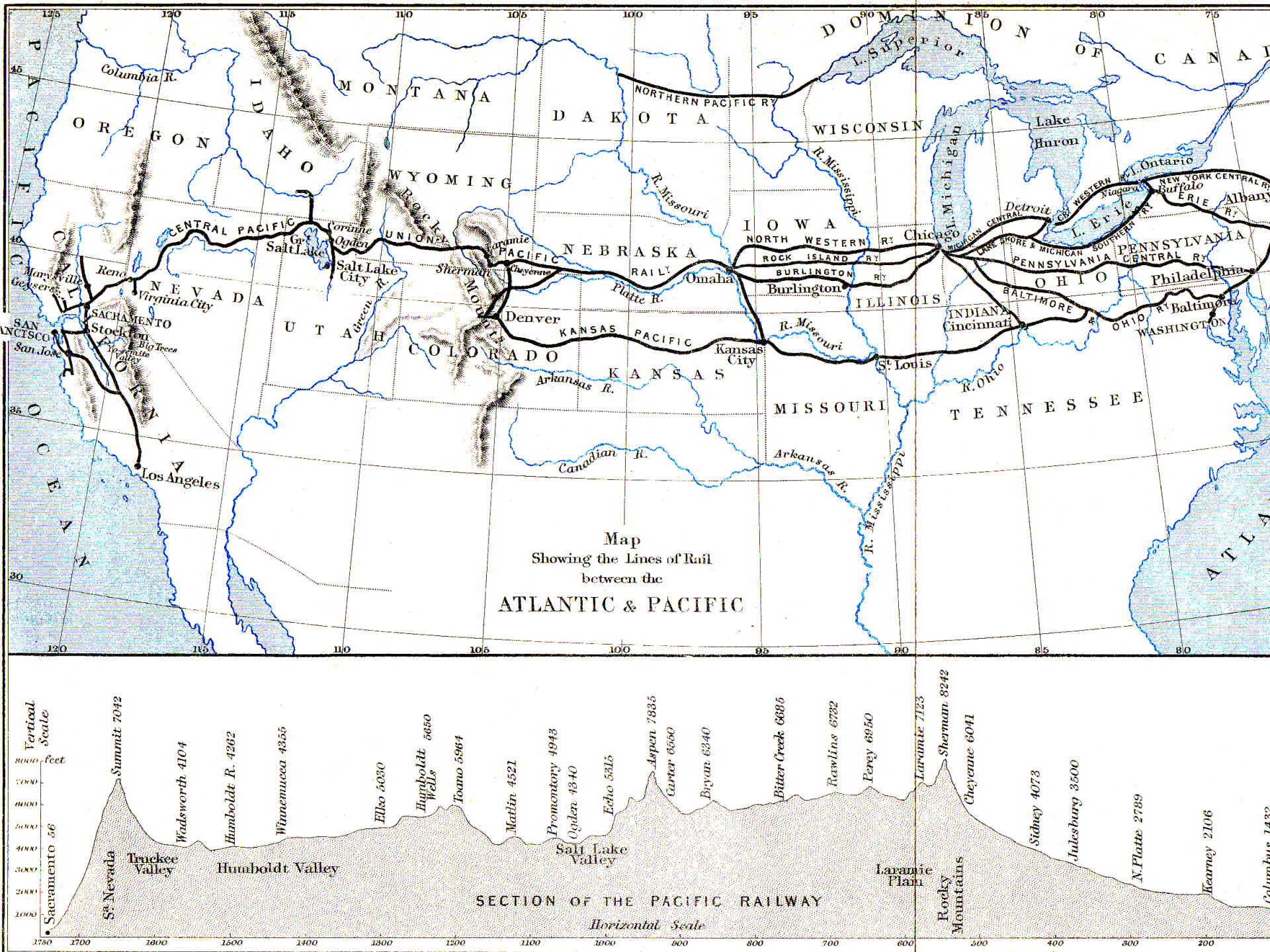
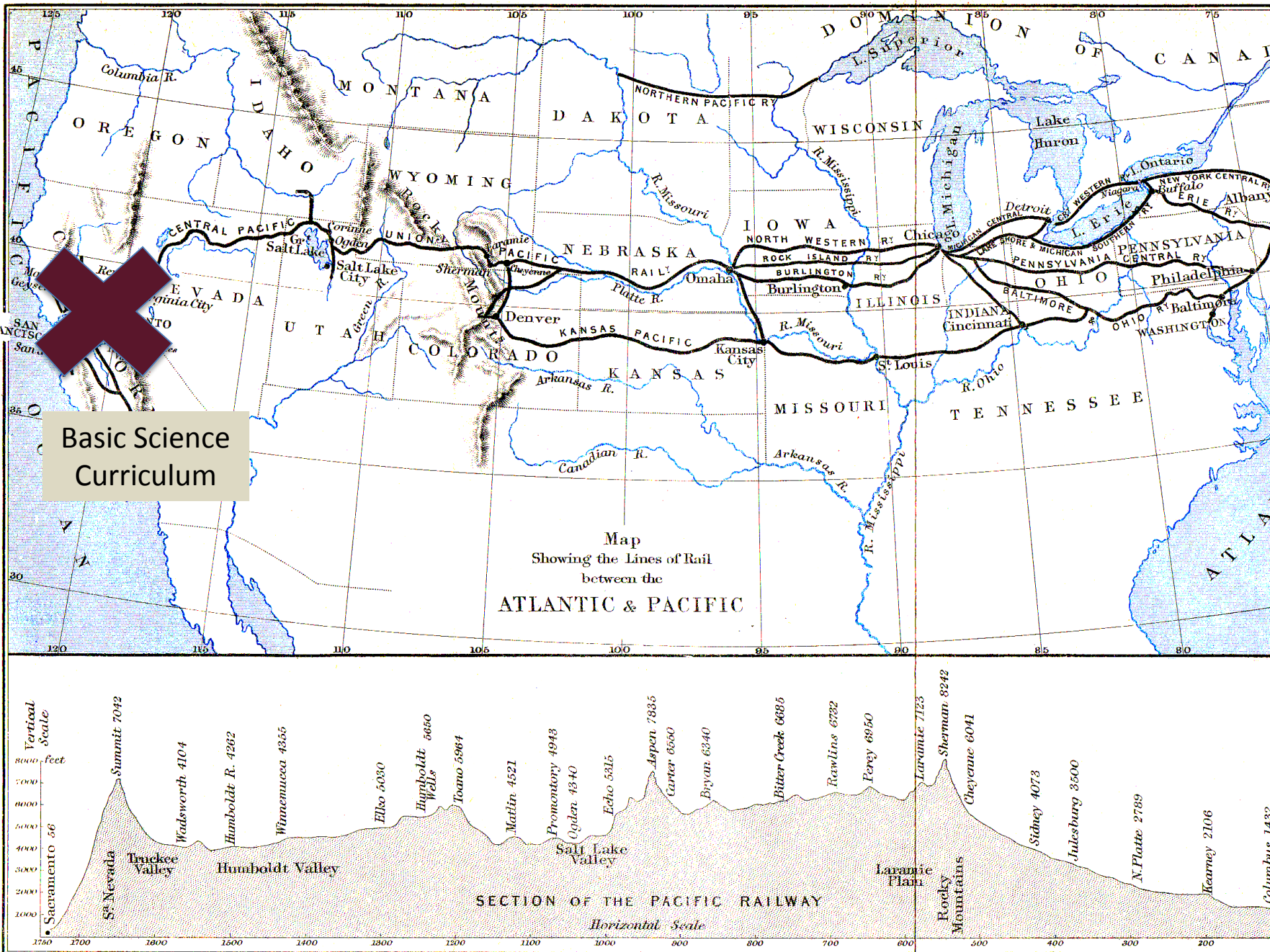
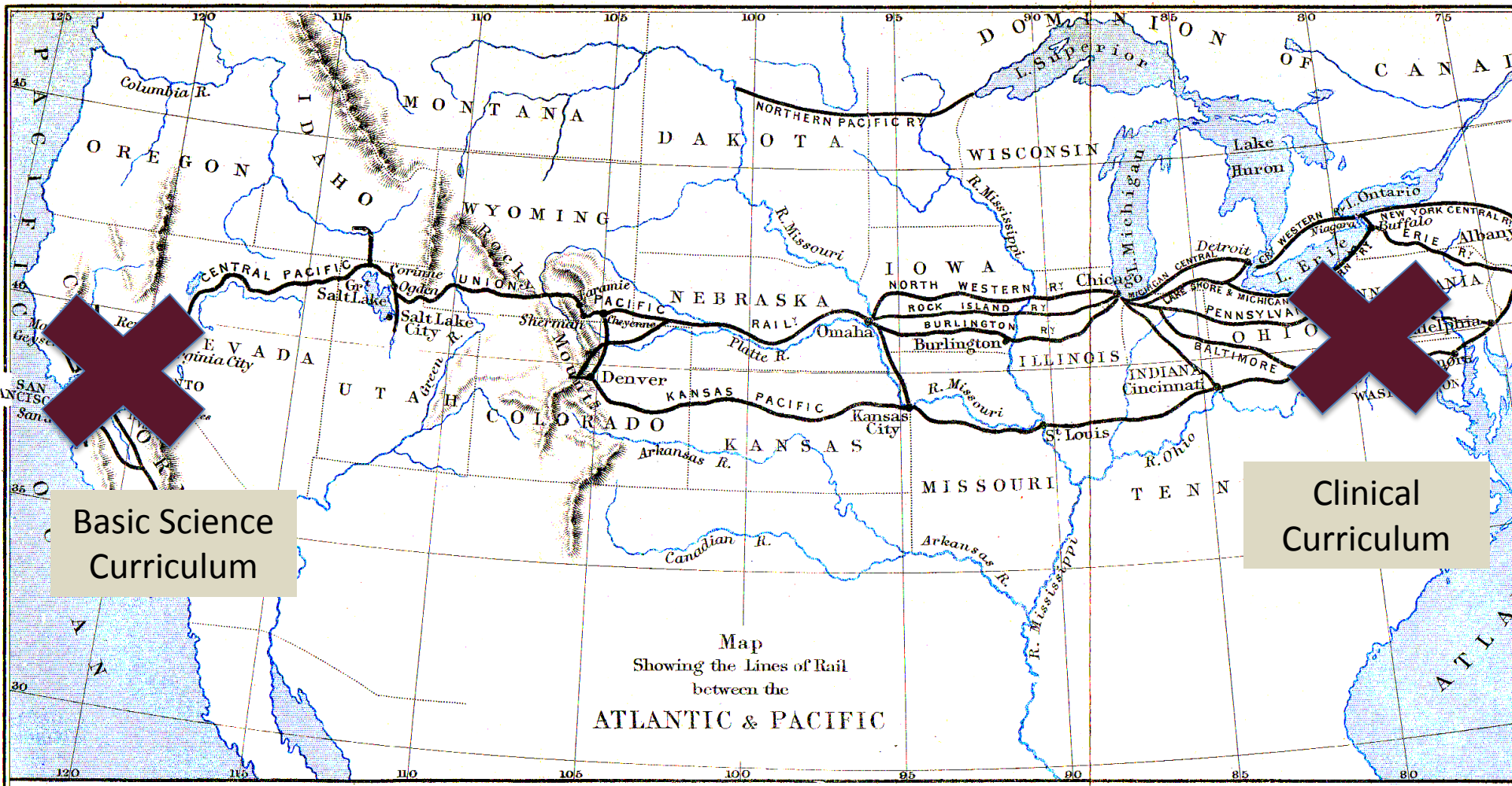

Map
Showing the Lines of Rail
between the
ATLANTIC & PACIFIC
PACIFIC OCEAN
ATLANTIC
DOMINION OF CANADA
Columbia R.
OREGON
IDAHO
MONTANA
DAKOTA
WYOMING
NEBRASKA
IOWA
WISCONSIN
Lake Michigan
Lake Huron
L. Superior
L. Ontario
L. Erie
NORTHERN PACIFIC RY
CENTRAL PACIFIC
UNION PACIFIC
KANSAS PACIFIC
NORTH WESTERN RY
ROCK ISLAND RY
BURLINGTON RY
MICHIGAN CENTRAL
LAKE SHORE & MICHIGAN SOUTHERN
NEW YORK CENTRAL R.
ERIE R.
PENNSYLVANIA CENTRAL RY
BALTIMORE & OHIO R.
Rocky Mts
R. Missouri
R. Mississippi
R. Ohio
Platte R.
Arkansas R.
Canadian R.
Green R.
Salt Lake City R.
Gr. Salt Lake
Ogden
Corinne
Laramie
Sherman
Cheyenne
Omaha
Burlington
Chicago
Detroit
Niagara
Buffalo
Albany
Philadelphia
Baltimore
Washington
Cincinnati
Indianapolis
St. Louis
Kansas City
Denver
Salt Lake City
Reno
Virginia City
Marysville
Geysers
SACRAMENTO
Stockton
San Jose
Big Trees
Yosemite Valley
Los Angeles
NEVADA
UTAH
COLORADO
KANSAS
MISSOURI
ILLINOIS
INDIANA
OHIO
PENNSYLVANIA
TENNESSEE
SECTION OF THE PACIFIC RAILWAY
Horizontal Scale
Vertical Scale
8000 feet
7000
6000
5000
4000
3000
2000
1000
Sacramento 56
Summit 7042
Wadsworth 4104
Humboldt R. 4262
Winnemucca 4355
Elko 5030
Humboldt Wells 5650
Toano 5964
Matlin 4521
Promontory 4943
Ogden 4340
Echo 5315
Aspen 7835
Carter 6550
Bryan 6340
Bitter Creek 6685
Rawlins 6732
Percy 6950
Laramie 7123
Sherman 8242
Cheyenne 6041
Sidney 4073
Julesburg 3500
N. Platte 2789
Kearney 2106
Columbus 1432
Sa Nevada
Truckee Valley
Humboldt Valley
Salt Lake Valley
Laramie Plain
Rocky Mountains
1750 1700 1600 1500 1400 1300 1200 1100 1000 900 800 700 600 500 400 300 200



Basic Science Curriculum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Humboldt Valley
Humboldt R. 4262
Winnemucca 4355
Elko 5030
Humboldt Wells 5650
Toano 5964
Matlin 4521
Promontory 4943
Ogden 4340
Salt Lake Valley
Echo 5315
Aspen 7835
Carter 6550
Bryan 6340
Bitter Creek 6685
Rawlins 6732
Percy 6950
Laramie Plain
Laramie 7123
Rocky Mountains
Sherman 8242
Cheyenne 6041
Sidney 4073
Julesburg 3500
N. Platte 2789
Kearney 2106
CENTRAL PACIFIC
UNION PACIFIC
NORTHERN PACIFIC RY
NORTH WESTERN RY
ROCK ISLAND RY
BURLINGTON RY
KANSAS PACIFIC
NEW YORK CENTRAL R.
LAKE SHORE & MICHIGAN
PENNSYLVANIA
BALTIMORE
Columbia R.
Green R.
Platte R.
Arkansas R.
Canadian R.
R. Missouri
R. Mississippi
R. Ohio
L. Superior
L. Michigan
Lake Huron
L. Ontario
L. Erie
Salt Lake City
Ogden
Laramie
Sherman
Cheyenne
Omaha
Burlington
Chicago
Detroit
Buffalo
Albany
Denver
Kansas City
St. Louis
Cincinnati
Virginia City
OREGON
IDAHO
MONTANA
DAKOTA
WYOMING
NEBRASKA
IOWA
WISCONSIN
ILLINOIS
INDIANA
OHIO
NEVADA
UTAH
COLORADO
KANSAS
MISSOURI
TENN
DOMINION OF CANADA


DURANGO & SILVERTON
473
DURANGO & SILVERTON
473


Genetics
Cell Biology
Anatomy
Physiology
473
473

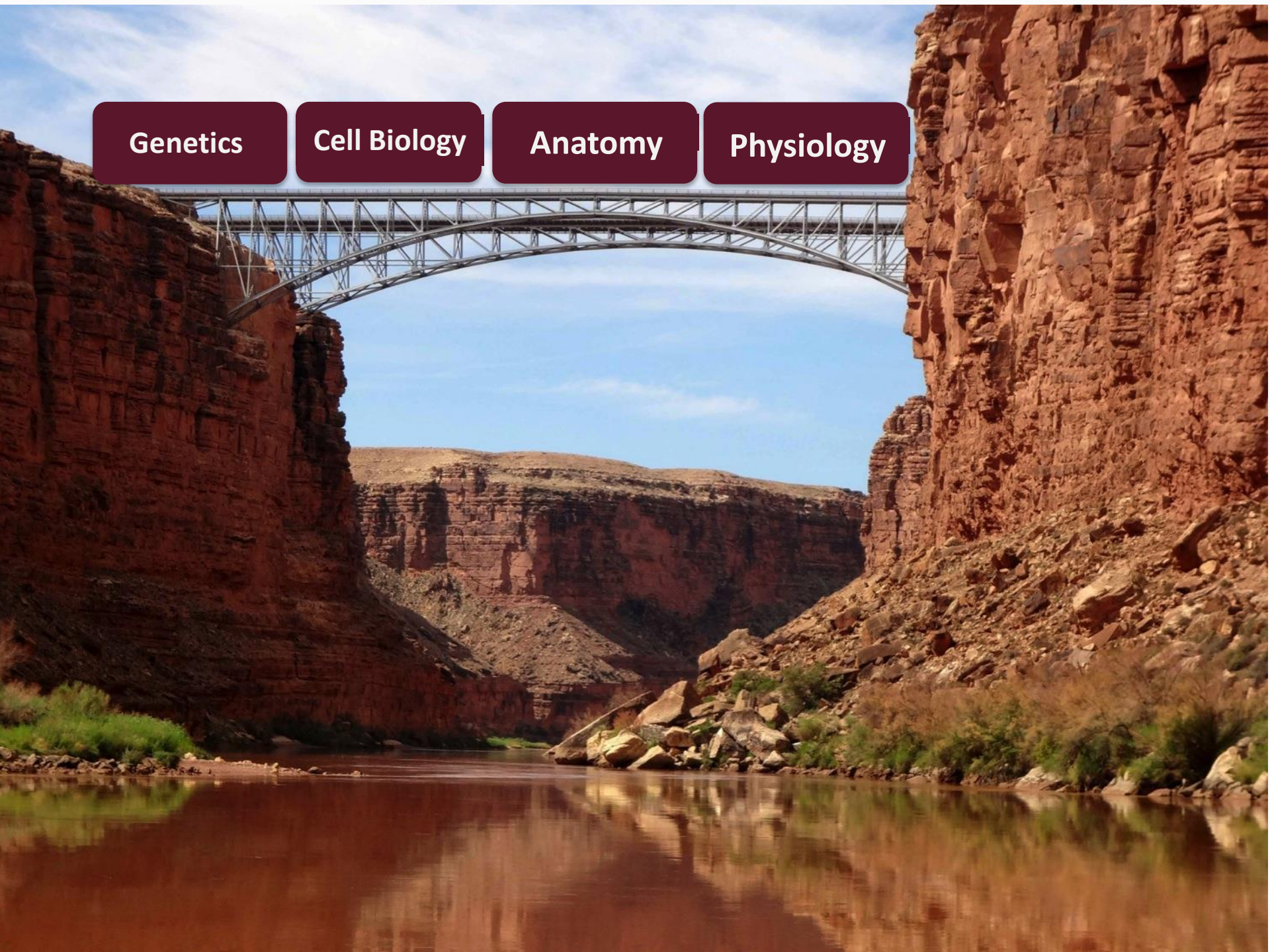

N178GC


WALNUT ST
THILL BLVD
HAMPTON RD
CLIFF DR
FAIRMEADE RD
ADOW GROVE RD
BEACON PL
210
02:15PM
Menu


Pattern Recognition
EBM

GRAND CANYON RAILWAY

How do we package basic science information so it survives the journey?


Genetics
Cell Biology
Anatomy
Physiology

CORE CONCEPTS – the containers

Information stored as a mental representation of a uniquely related group of objects, symbols, events.

- Name, symbol, image
- Metaphors
- Stories

Do **not** think of a

Do **not** think of a

TREE

Do **not** think of a

TREE

Knowledge Organization – the packaging

A progressively rich and organized semantic network of relationships between concepts that confers meaning.

- Reduced
- Dispersed
- Elaborated
- Encapsulated

Bordage. Academic Medicine, 1994; 11:76.

Tree

Noun

l **plant**

em, or t ing to a **considerable height**, a lateral **brai** e ground.

Tree

Noun

A perennial **plant** with an elongated and thick wooden stem, or **trunk**, growing to a **considerable height**, and bearing many large lateral **branches** with leaves at some distance from the ground.

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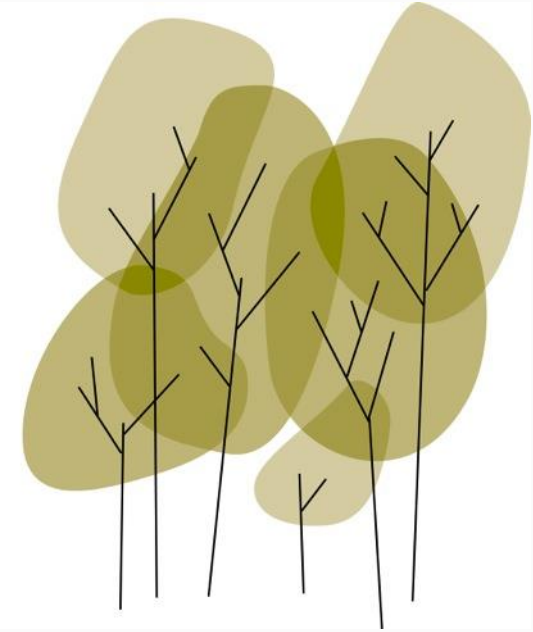
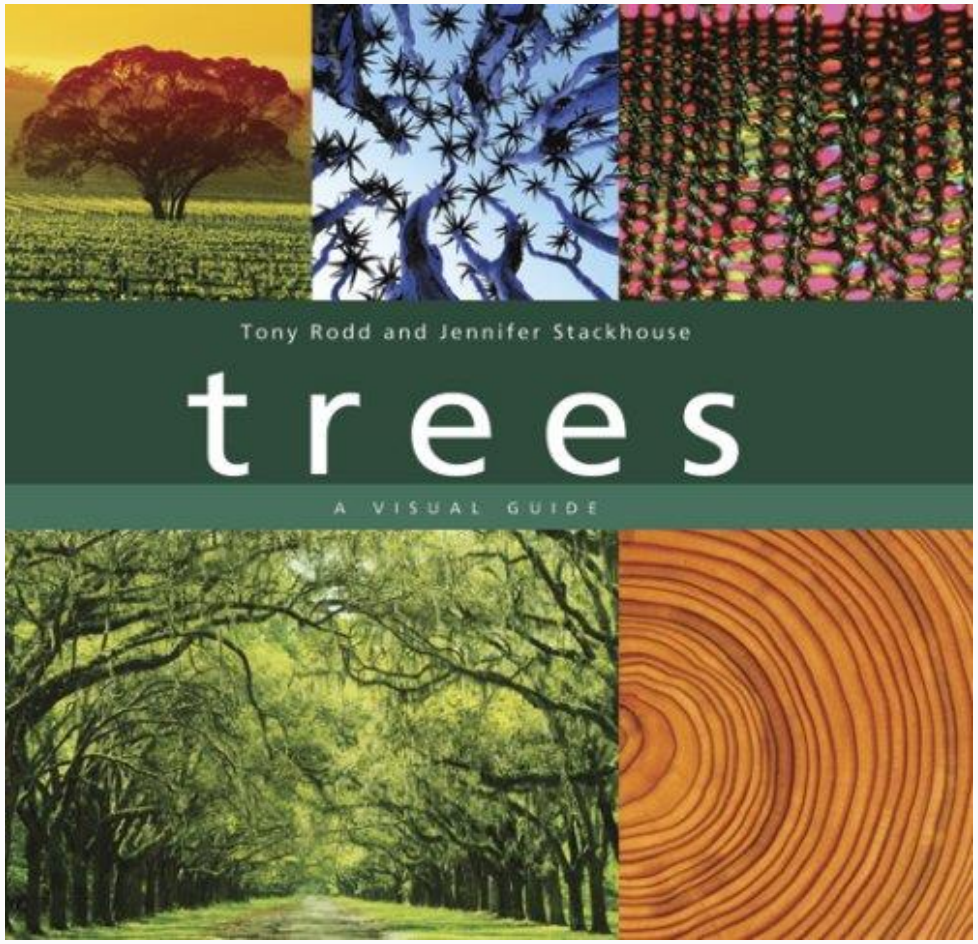
Conceptual understanding allows for:

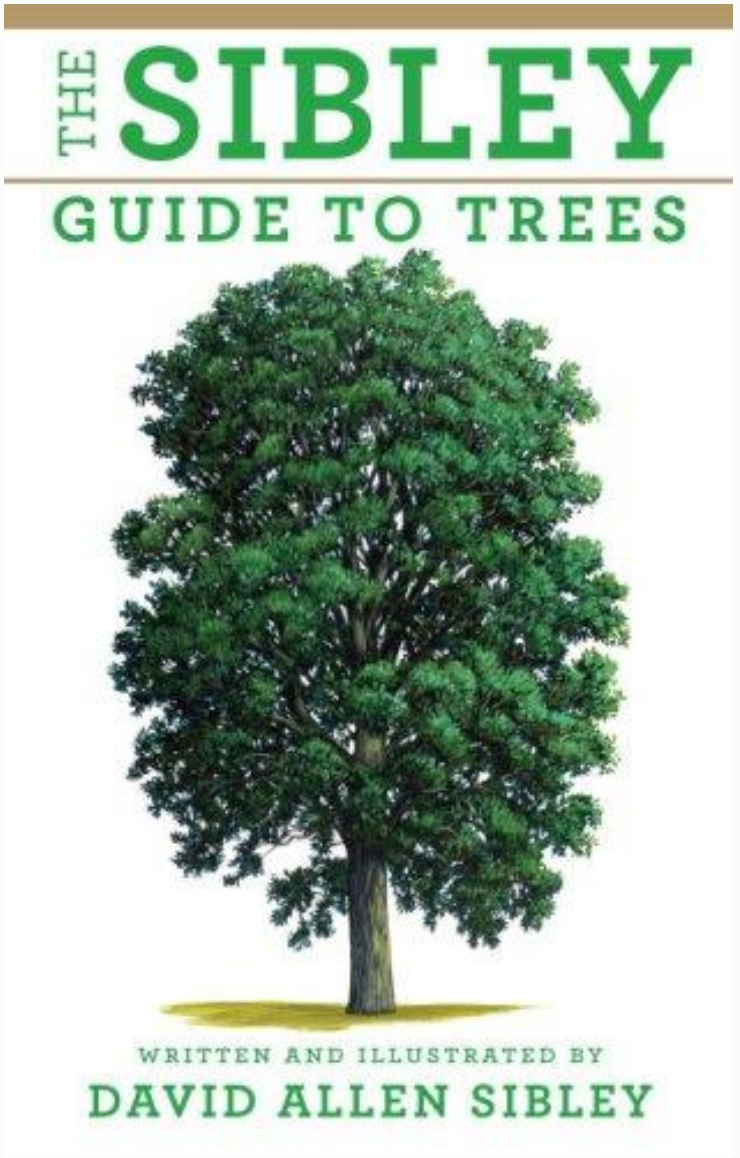
- Stable, rich and efficient memory
- Categorization
- Inference
- Abstraction
- Learning
- Decision-making
- Creativity

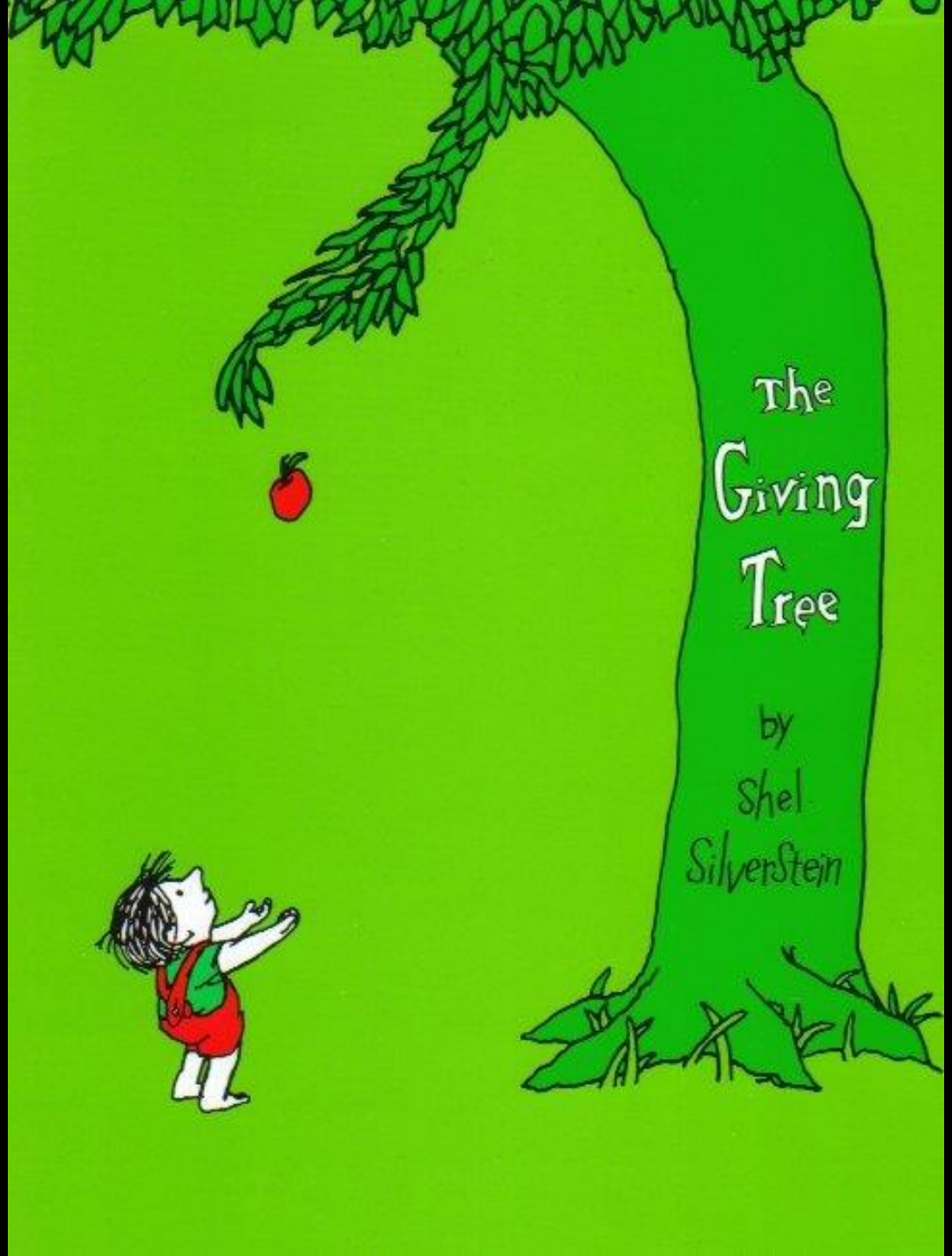

174
FIRE LINE DO NOT CROSS




http://danieladrover.carbonmade.com


Tony Rodd and Jennifer Stackhouse
trees
A VISUAL GUIDE


THE SIBLEY
GUIDE TO TREES
WRITTEN AND ILLUSTRATED BY
DAVID ALLEN SIBLEY


The
Giving
Tree
by
Shel
Silverstein

How do we safely and effectively package biomedical concepts?

Integration of Basic Sciences and Clinical Sciences in Oral Radiology Education for Dental Students

Mariam T. Baghdady, B.D.S., M.Sc., F.R.C.D.(C), Dip. A.B.O.M.R.; Heather Carnahan, Ph.D.; Ernest W.N. Lam, D.M.D., Ph.D., F.R.C.D.(C); Nicole N. Woods, Ph.D.

Abstract: Educational research suggests that cognitive processing in diagnostic radiology requires a solid foundation in the basic sciences and knowledge of the radiological changes associated with disease. Although it is generally assumed that dental students must acquire both sets of knowledge, little is known about the most effective way to teach them. Currently, the basic and clinical sciences are taught separately. This study was conducted to compare the diagnostic accuracy of students when taught basic sciences segregated or integrated with clinical features. Predoctoral dental students (n=51) were taught four confusable intrabony abnormalities using basic science descriptions integrated with the radiographic features or taught segregated from the radiographic features. The students were tested with diagnostic images, and memory tests were performed immediately after learning and one week later. On immediate and delayed testing, participants in the integrated basic science group outperformed those from the segregated group. A main effect of learning condition was found to be significant ($p<0.05$). The results of this study support the critical role of integrating biomedical knowledge in diagnostic radiology and shows that teaching basic sciences integrated with clinical features produces higher diagnostic accuracy in novices than teaching basic sciences segregated from clinical features.

Journal of Dental Education ■ Volume 77, Number 6 June 2013

Table 1. Example of the radiographic features of periapical sclerosing osteitis explained in the two learning groups

SEGREGATED BASIC SCIENCE	
Basic Science explanation	The body responds to microbiological injury with inflammation. The inflammatory response destroys or walls off the injurious stimulus and sets up an environment for repair of damaged tissue. Inflammatory lesions are the most common pathological lesions in the jawbones. Normally, bone metabolism represents a balance of osteoclastic bone resorption and osteoblastic bone formation. Inflammatory mediators (cytokines, prostaglandins, etc.) tip this balance either to bone resorption or bone formation. Usually there is a combination of both processes. The initial source of inflammation in periapical inflammatory lesions is necrotic pulp. Toxic metabolites from the necrotic pulp exit through the root apex or the accessory canals causing an inflammatory reaction in periapical structures and the surrounding bone. Sclerosing osteitis is a local response of bone around the apex of a tooth that occurs secondarily to necrosis of the pulp.
Radiographic feature	Location: In most cases, the epicenter of periapical inflammatory lesions is found at the apex of the involved tooth. Less often, such lesions are centered around other regions of the tooth root. Most cases occur in the premolar-molar area in the mandible. Periphery: The periphery of periapicals inflammatory lesions is ill defined with a gradual transition from normal to abnormal bone. Internal Structure: Internally, these lesions may appear either mainly radiolucent (periapical rarefying osteitis) or mainly radiopaque (periapical sclerosing osteitis) or more commonly a mixture of both. Effect on surrounding structures: Periapical inflammatory lesions usually cause loss of lamina dura and widening of the apical portion of the periodontal ligament space.

Table 1. Example of the radiographic features of periapical sclerosing osteitis explained in the two learning groups

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The body responds to microbiological injury with inflammation. Normally, bone metabolism represents a balance of osteoclastic bone resorption and osteoblastic bone formation. Inflammatory mediators (cytokines, prostaglandins, etc.) tip this balance either to bone resorption or bone formation. Radiographically, the affected cancellous bone will appear either radiolucent (resorption) or radiopaque (bone formation). Usually there is a combination of the two processes. When most of the lesion consists of increased bone formation, the term "periapical sclerosing osteitis" is used; when most of the lesion is undergoing bone resorption, the term "periapical rarefying osteitis" is used. The initial source of inflammation in periapical inflammatory lesions is a necrotic pulp. Toxic metabolites from the necrotic pulp exit through the root apex or the accessory canals causing an inflammatory reaction in the surrounding bone. Radiographically, the lesion is restricted to a region around the tooth with a center typically located at the apex of the root. However, lesions of pulpal origins also may be located anywhere along the root surface because of the accessory canals. The periphery of periapical inflammatory lesions is ill defined, showing a gradual transition from the surrounding normal trabecular bone into the abnormal bone pattern. Radiographically, there is loss of lamina dura and widening of the periodontal ligament space around the affected tooth, the bone resorption being stimulated by the inflammatory process.

CROUP

CLIPP CASE 12

EPIDEMIOLOGY:

Although croup can cause respiratory distress, it is usually a benign condition with a low mortality rate. However, the abrupt nature of the symptoms and the way in which a child may struggle to breathe often cause parental concern such that croup is responsible for up to 15% of emergency visits due to respiratory disease in children in the US.

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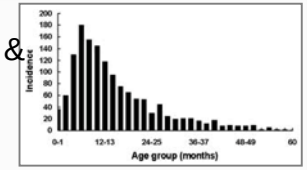

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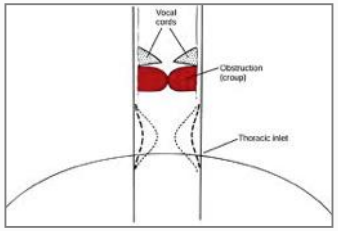

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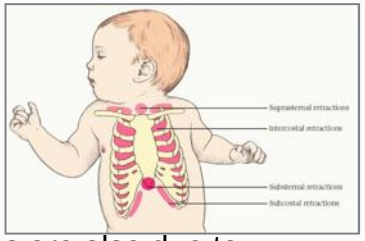

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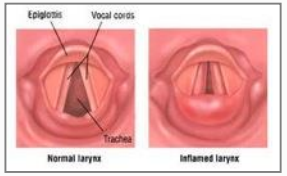

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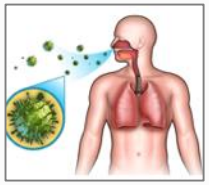

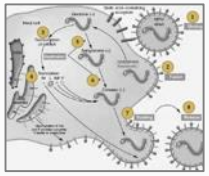

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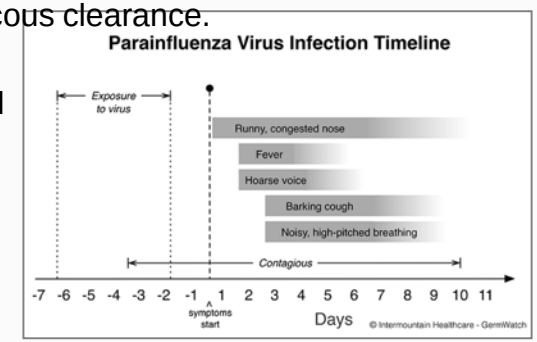

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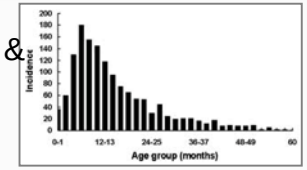

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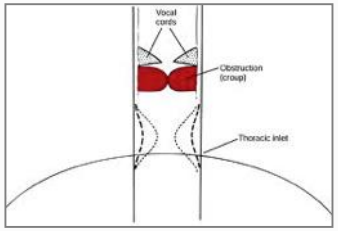

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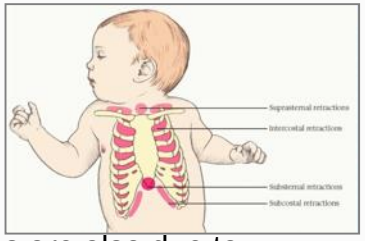

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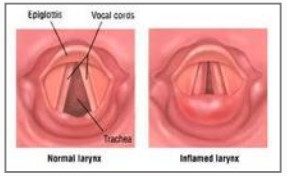

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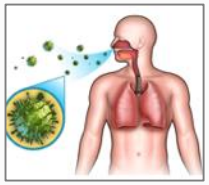

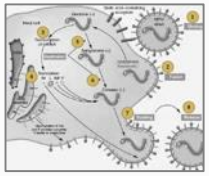

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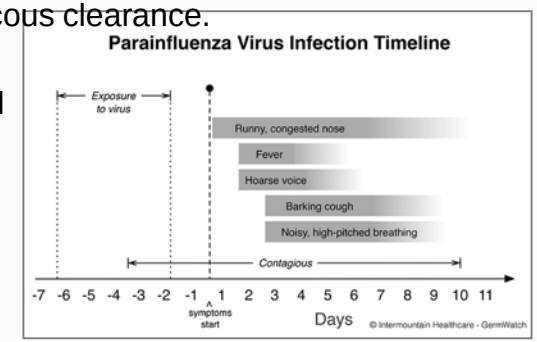

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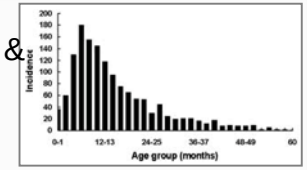

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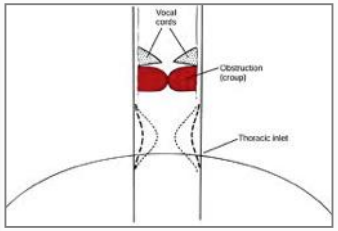

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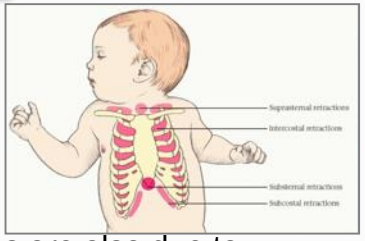

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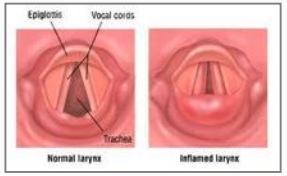

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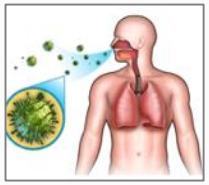

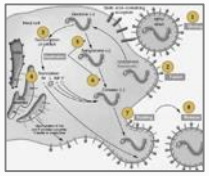

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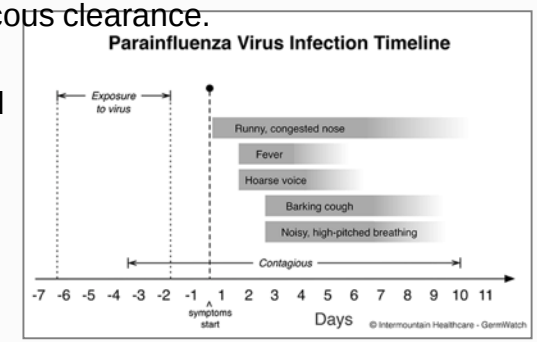

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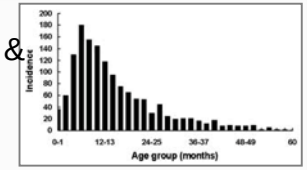

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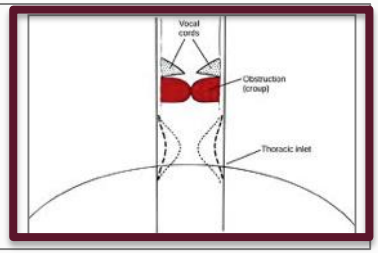

Retractions: Why?
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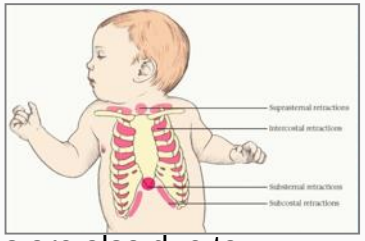
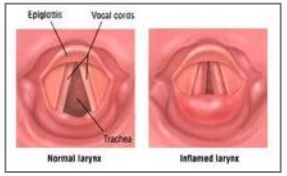
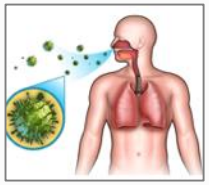


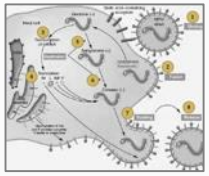
Hoarseness: **Why?**
Inflammation and edema of larynx causes ↓ mobility of the vocal cords, resulting in hoarseness.



Symptoms typically worse at night: Why? Not known.

Prodrome of mild cold & low-grade fever:



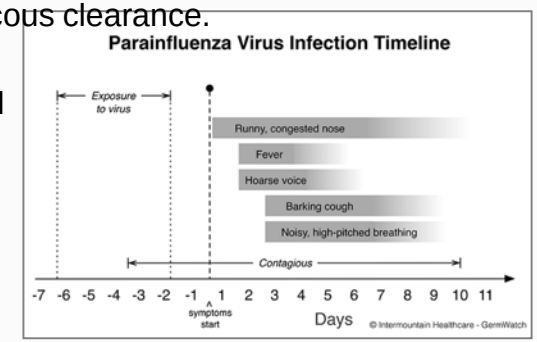


Infection: Up to 80% cases of croup are caused by parainfluenza viruses (PIV) inhaled on droplets that initially infect epithelial cells of the nose and oropharynx. PIV rarely cause viremia. They generally stay in the upper respiratory tract, causing only cold-like symptoms.

Replication: Significant viral replication within 24 hours of infection, peaking after 2-5 days.

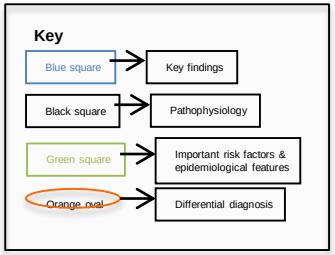
Effects: PIV can cause giant cell formation and cell lysis, large scale up-regulation of inflammatory cytokines (peak duration 7-10 days post-infection), increased chloride secretion and inhibited sodium absorption across the epithelium (contributing to airway edema), increased mucous production in the upper airways, and compromised ciliary function, decreasing mucous clearance.

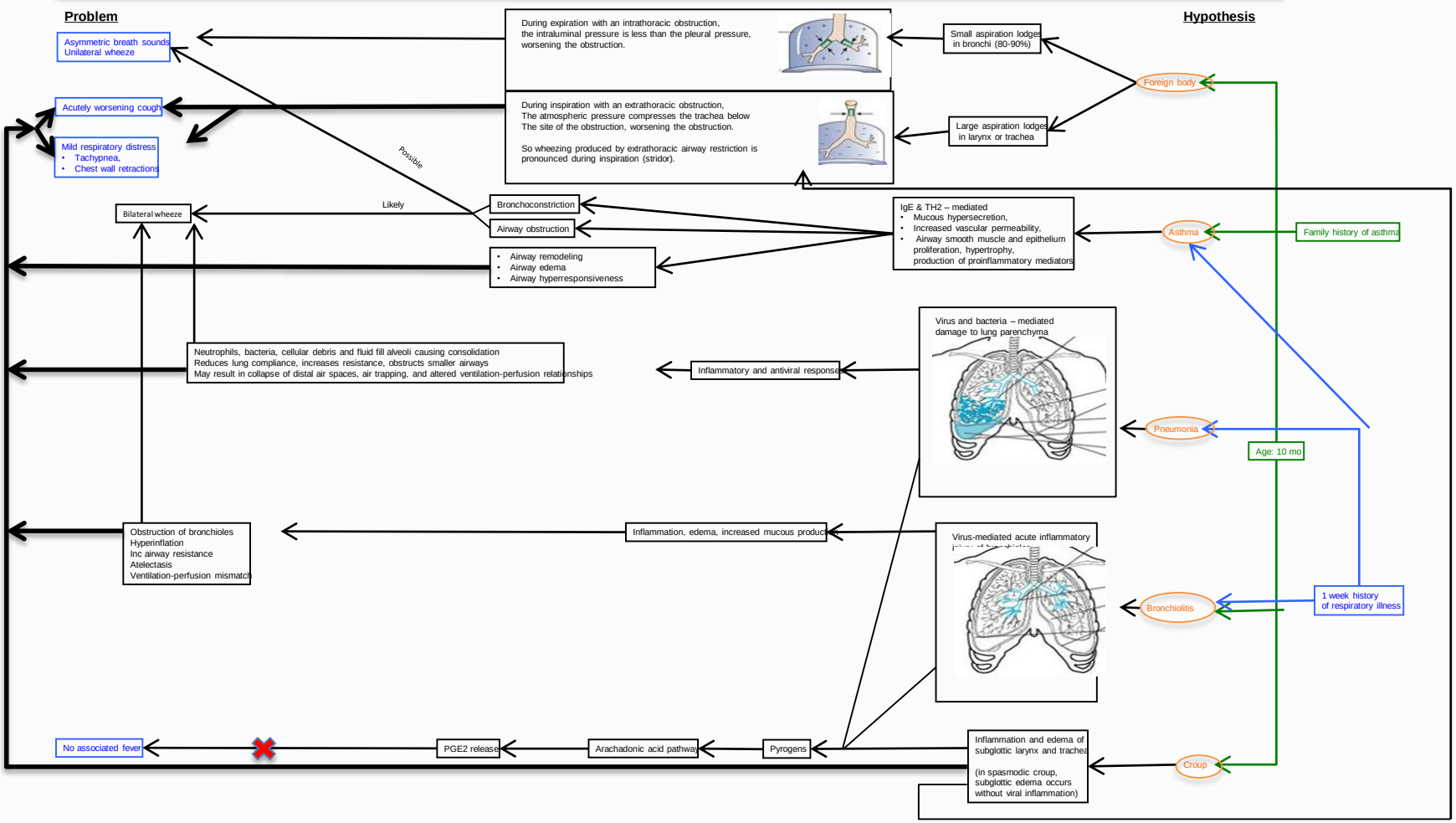
Migration: ~25% of cases, the virus spreads distally to the ciliated and alveolar cells of the lower respiratory tract. PIV-1&2, which are associated with croup tend to infect the larynx and upper trachea, whereas PIV-3, which is associated with bronchiolitis and pneumonia, infects the distal airways.



Mechanistic Case Diagram
CLIPP Case 12

Summary statement
Anna is a 10-month-old female with a one-week history of respiratory illness and an acutely worsening cough. She has mild respiratory distress and asymmetric breath sounds with unilateral wheezing in the absence of fever and cyanosis.





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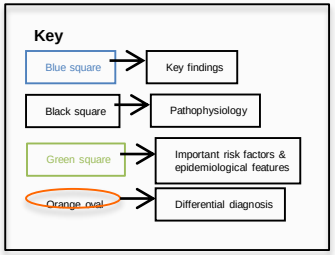

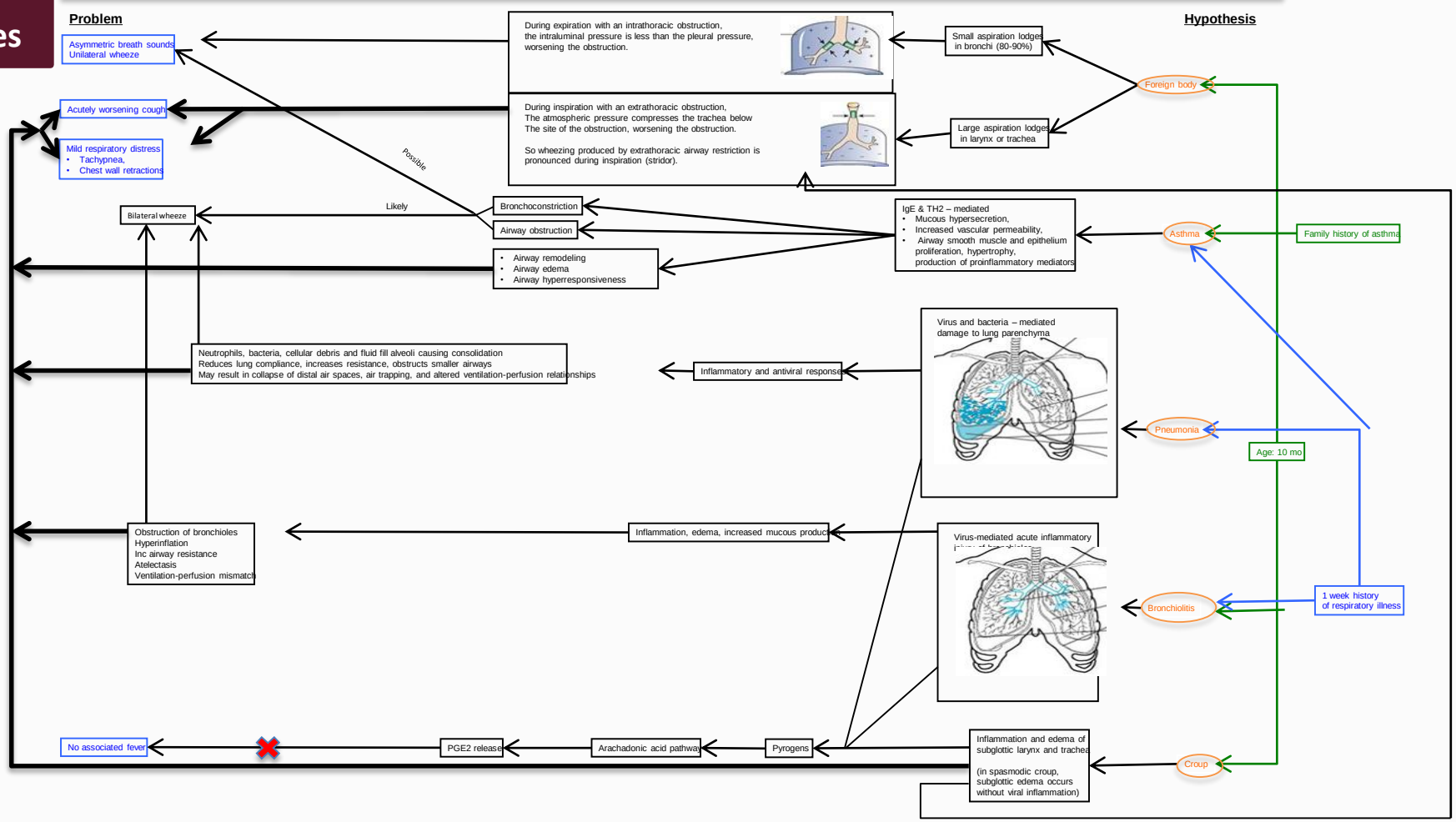

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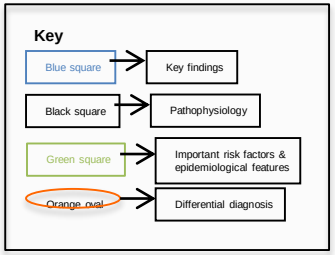

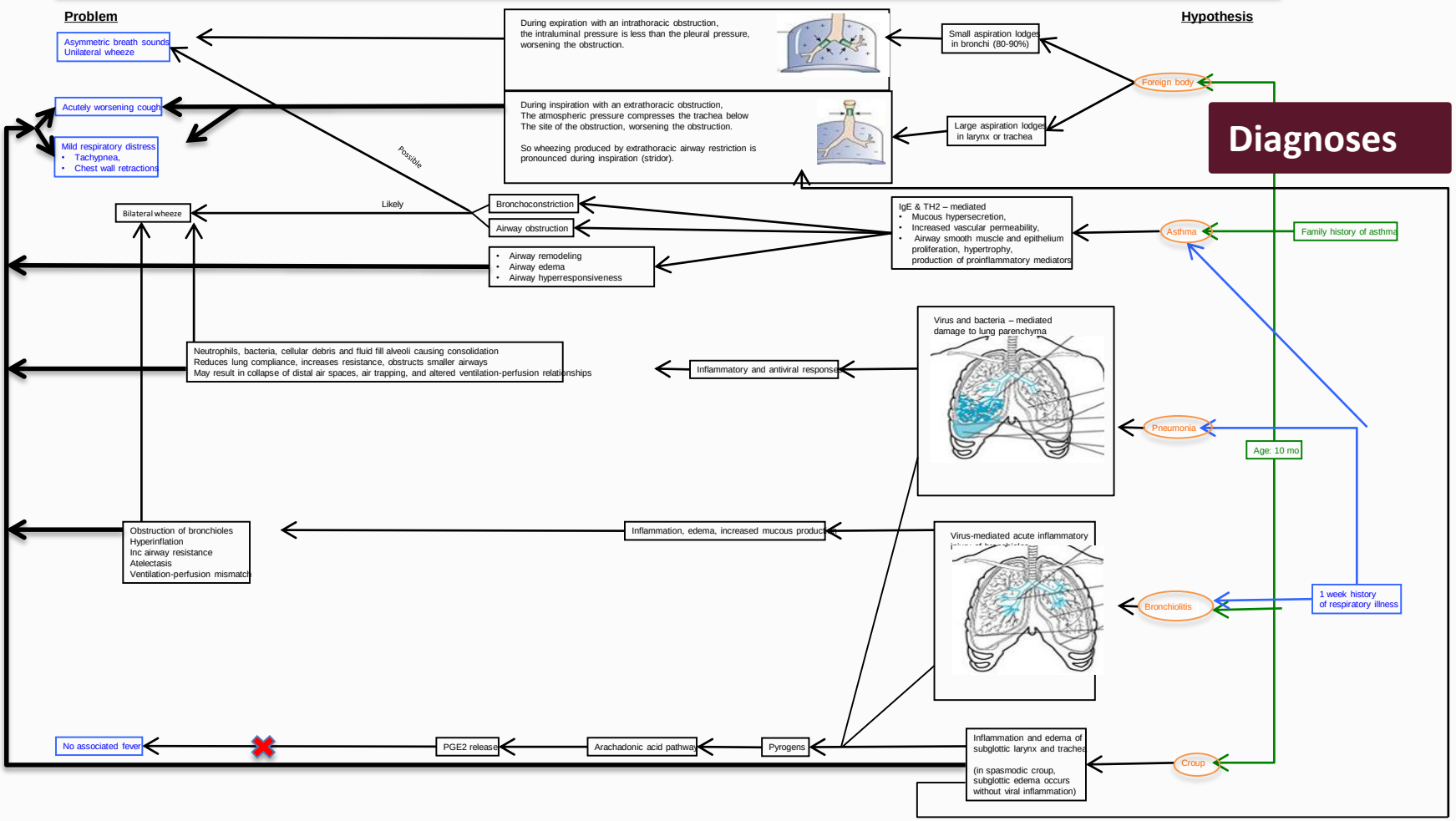

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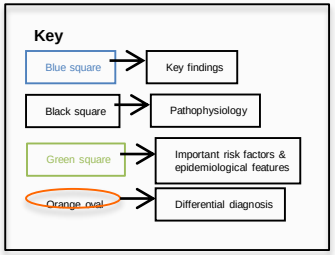

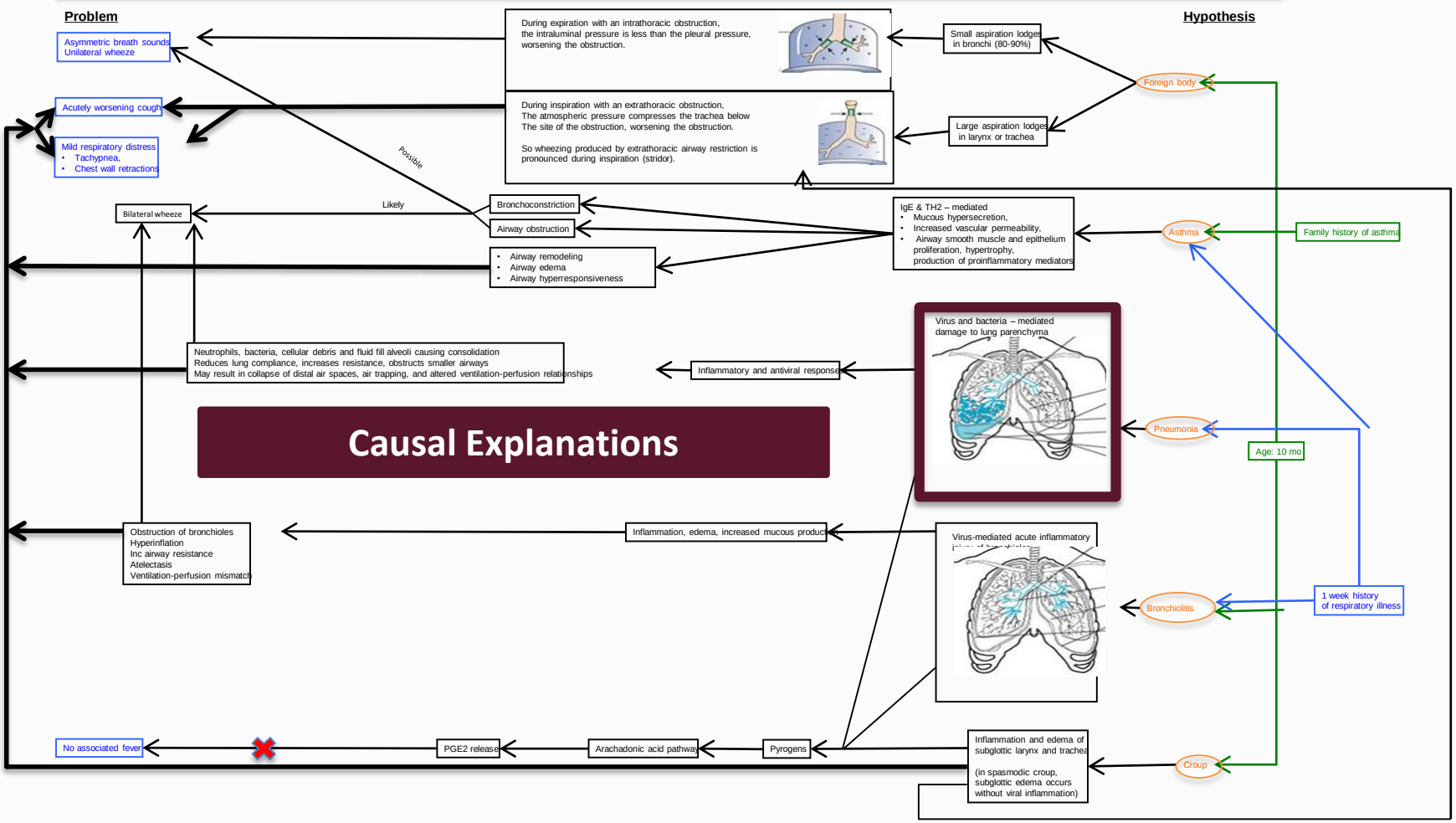

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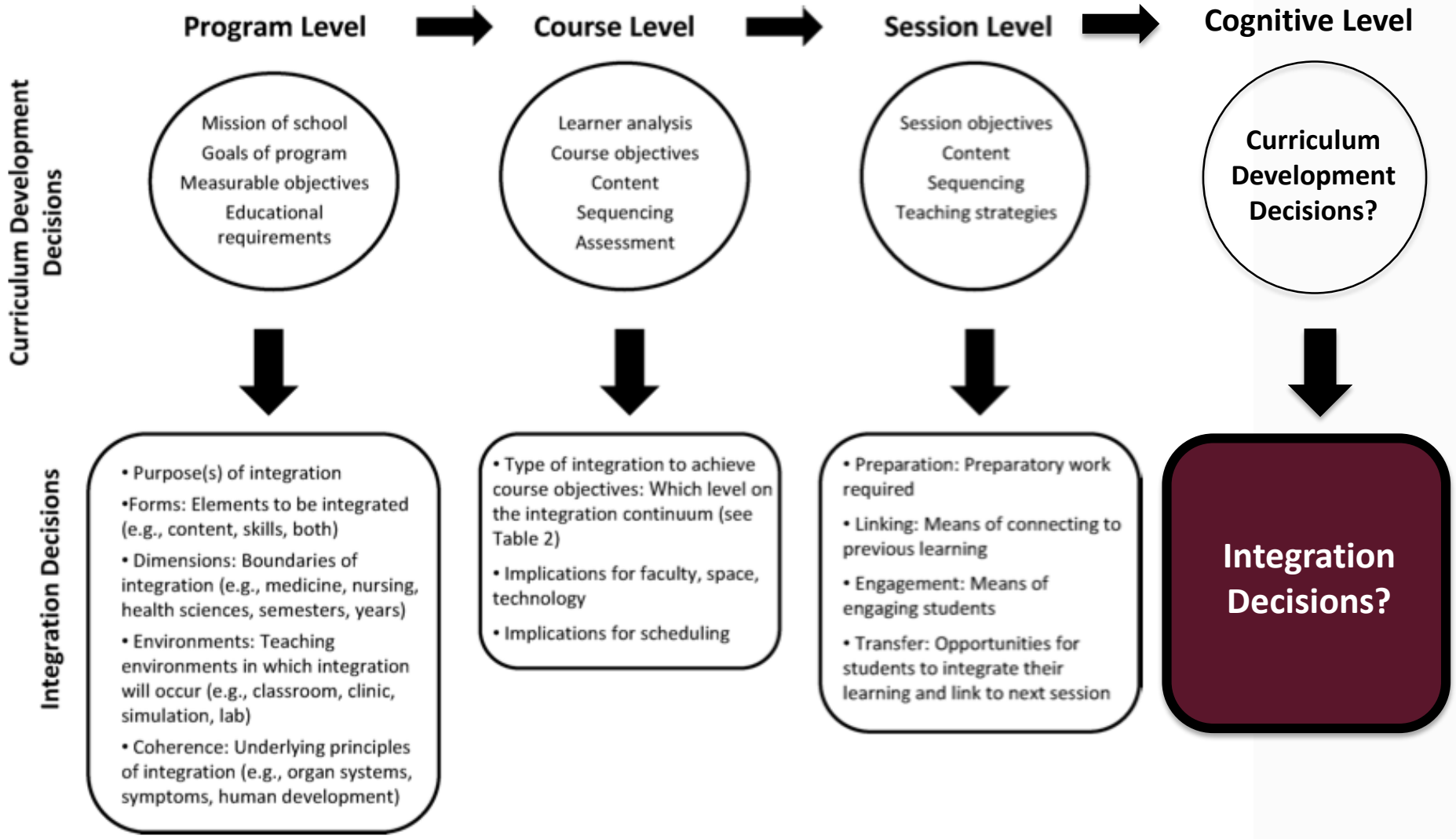
Slowing Down When You Should: A New Model of Expert Judgment

Carol-anne E. Moulton, Glenn Regehr, Maria Mylopoulos, and Helen M. MacRae

Clinical Judgment Review Paper

Acad Med. 2007;82(10 Suppl):S109–S116.

How do we put the conceptual packages to work once they arrive safely on the clinical side?


Program Level
Course Level
Session Level
Cognitive Level
Curriculum Development Decisions
Mission of school
Goals of program
Measurable objectives
Educational requirements
Learner analysis
Course objectives
Content
Sequencing
Assessment
Session objectives
Content
Sequencing
Teaching strategies
Curriculum Development Decisions?
Integration Decisions
• Purpose(s) of integration
•Forms: Elements to be integrated (e.g., content, skills, both)
• Dimensions: Boundaries of integration (e.g., medicine, nursing, health sciences, semesters, years)
• Environments: Teaching environments in which integration will occur (e.g., classroom, clinic, simulation, lab)
• Coherence: Underlying principles of integration (e.g., organ systems, symptoms, human development)
• Type of integration to achieve course objectives: Which level on the integration continuum (see Table 2)
• Implications for faculty, space, technology
• Implications for scheduling
• Preparation: Preparatory work required
• Linking: Means of connecting to previous learning
• Engagement: Means of engaging students
• Transfer: Opportunities for students to integrate their learning and link to next session
Integration Decisions?

From Understanding to Action

Basic science plays an essential role in the student's progress towards independence - as their responsibilities move from understanding and explaining towards diagnostic and therapeutic decision-making.

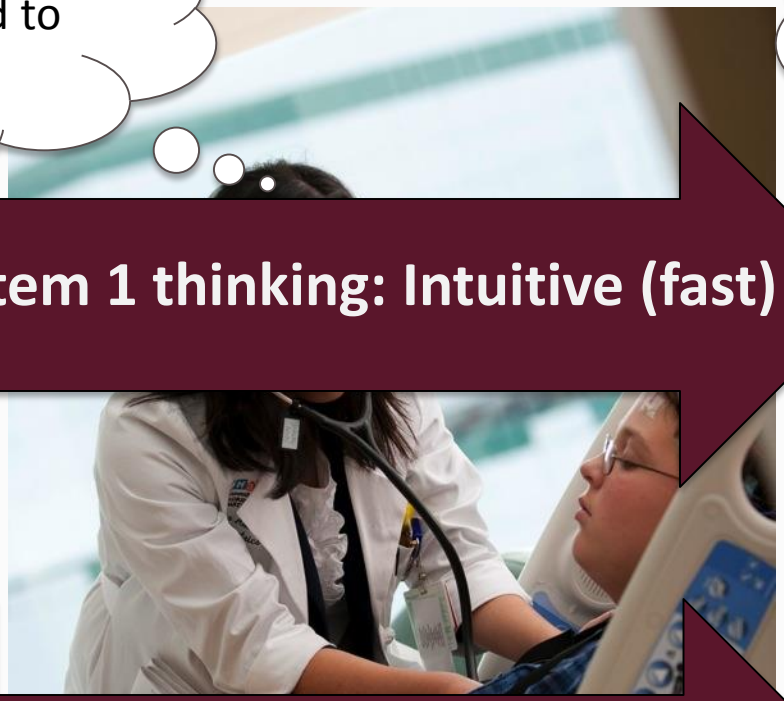
The knowledge is not there for its own sake, but to support the responsibilities the student will be given.

Adapted from Lou Pangaro (JIAMSE 2010)

Clinical Decision Making

Does she need to be diuresed?

I'm in congestive heart failure with poor liver & renal function.



System 1 thinking: Intuitive (fast)

Findings
- SOB
- Tachycardia
- Hypertension
- Urine output
- Albumin levels

Signs & Symptoms
- SOB
- Tachycardia
- Hypertension
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System 2 thinking: Analytical (slow)

Cognitive integ
- Myocardial f
- Peripheral vascu permeability
- Glomerular function
- Albumin synthesis

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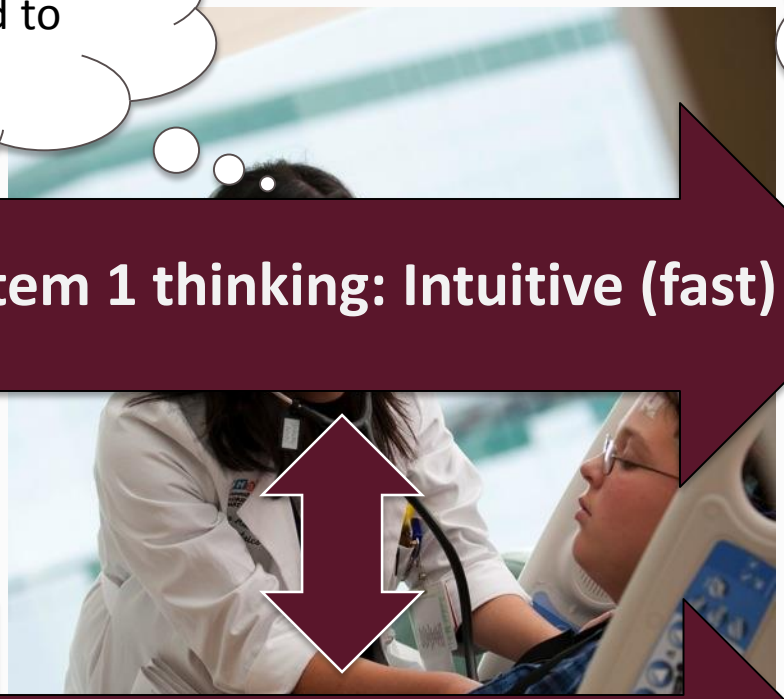

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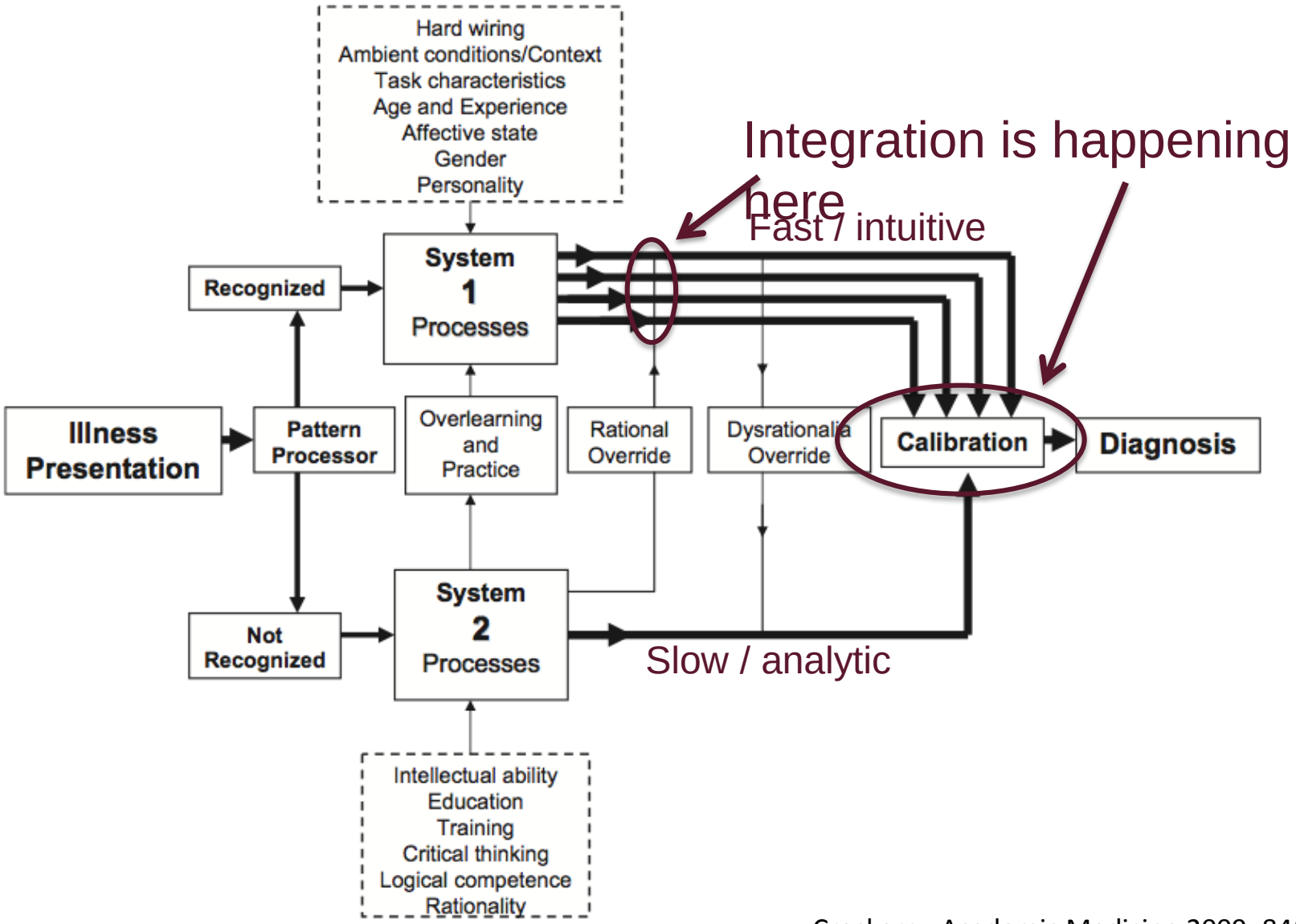
Clinical Decision Making: A Cognitive Dual Process



Croskerry. Academic Medicine 2009; 84(8):1022

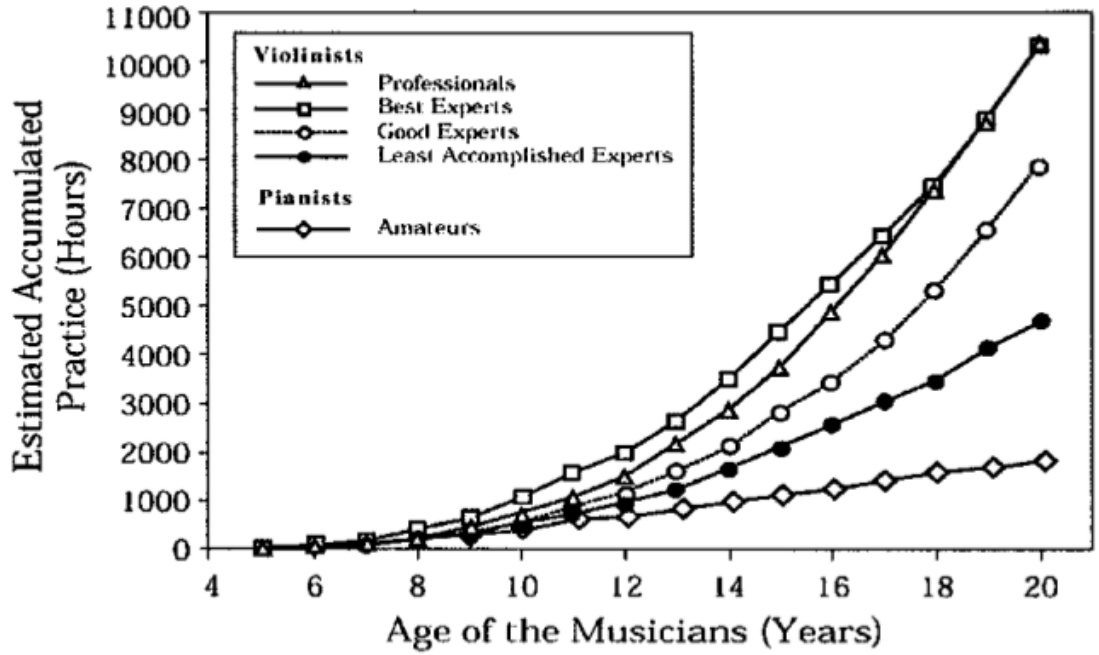


Figure 2. Estimated amount of time for solitary practice as a function of age for the middle-aged *professional* violinists (*triangles*), the *best* expert violinists (*squares*), the *good* expert violinists (*empty circles*), the *least accomplished* expert violinists (*filled circles*) and *amateur* pianists (*diamonds*). (From "The role of deliberate practice in the acquisition of expert performance," by K. A. Ericsson, R. Th. Krampe, and C. Tesch-Römer, 1993, *Psychological Review*, *100(3)*, p. 379 and p. 384. Copyright 1993 by American Psychological Association. Adapted with permission.)

Deliberate Practice and the Acquisition and Maintenance of Expert Performance in Medicine and Related Domains

K. ANDERS ERICSSON

ACADEMIC MEDICINE, VOL. 79, NO. 10 / OCTOBER SUPPLEMENT 2004

Frequent Practice

Relevant Decision-Making

- Diagnosis
- Work-up
- Therapy
- Prognosis

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Relevant Decision-Making

- Diagnosis
- Work-up
- Therapy
- Prognosis

Common Conditions (~300)

- Asthma
- Bronchiolitis
- Depression
- Diabetes
- Gastric reflux disease
- Hypertension
- Influenza
- Multiple sclerosis
- Postpartum infection
- Venous thrombosis

Crohn's Disease – acute presentation; treatment

- Digestion and absorption
- GI secretion
- GI water transport
- Mucosal immunity
- Microbiome
- Systemic inflammation
- Chronic inflammation
- Autoimmunity
- Nutritional immunity
- Acid-base balance
- Individualizing therapeutics
- Toxic drug effects
- Cellular transport mechanisms
- Steady state metabolism
- Nitrogen balance
- Micronutrients
- Whole body energy balance
- Intracellular energy regulation
- Microbial immunology
- Microbial pathogenesis
- Cancer metabolism
- Genetics of drug

MedU Science: Goals for Learners

To understand how the application of their basic science knowledge to the practice of everyday medicine makes them better doctors and improves patient care and improves health care outcomes.

- Improve the accuracy and efficiency of diagnosis
- Improve the accuracy and cost effectiveness of work-up
- Improve the targeted choice and cost effectiveness of therapy
- Routine application of basic science core concepts
- Continuous formative assessment

MedU Science Virtual Patient Cases

- Targeted to late clinical learners
- Appropriate for all core disciplines
- Common presentations and problems
- 20 minute cases
- Focus on decision-making
- Applied core basic science concepts
- Knowledge calibration
- Ongoing formative assessment
- Align with the AAMC's CEPAER project

MedU Science: Goals for Faculty

To meet the needs for better methods and tools to effectively integrate the basic sciences into the clinical curriculum in a meaningful way through cognitive integration and collaboratively developed teaching tools.

- Flexibility in use of cases within the clinical curriculum
- Tools for active learning sessions with robust facilitator guides
- Equally effective for basic science and clinical faculty educators
- Tools for integration into rounds and bedside teaching


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Embryology:
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Immunology/inflammation:
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Michael Bradbury, PhD (Alabama COM)

Neuroscience:
Eve Gallman, PhD (GRU-UGA)

Microbiology:
Donna Russo, PhD (Drexel)

Biochemistry:
Tracy Fulton, PhD (UCSF)

Cell Biology & Signaling:
Stephen Everse, PhD (UVM

IAMSE

Basic Science Curriculum

Clinical Curriculum

Map
Showing the Lines of Rail
between the
ATLANTIC & PACIFIC

SECTION OF THE PACIFIC RAILWAY
Horizontal Scale

Vertical Scale
8000 feet
7000
6000
5000
4000
3000
2000
1000
Sacramento 56

Sa Nevada
Summit 7042
Truckee Valley
Wadsworth 4104
Humboldt Valley
Humboldt R. 4262
Winnemucca 4355
Elko 5030
Humboldt Wells 5650
Toano 5964
Matlin 4521
Promontory 4943
Ogden 4340
Salt Lake Valley
Echo 5315
Aspen 7835
Carter 6550
Bryan 6340
Bitter Creek 6685
Rawlins 6732
Percy 6950
Laramie Plain
Laramie 7123
Rocky Mountains
Sherman 8242
Cheyenne 6041
Sidney 4073
Julesburg 3500
N. Platte 2789
Kearney 2106

1750 1700 1600 1500 1400 1300 1200 1100 1000 900 800 700 600 500 400 300 200

Lessons for Crossing the Synapse

- Collaborative curriculum engineering
- Core concepts
- Packaged well
- Clerkship practice
- Common problems
- Relevant decision making
- Clinical excellence





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