Bringing Basic Immunology to Life via Problem-Based Learning

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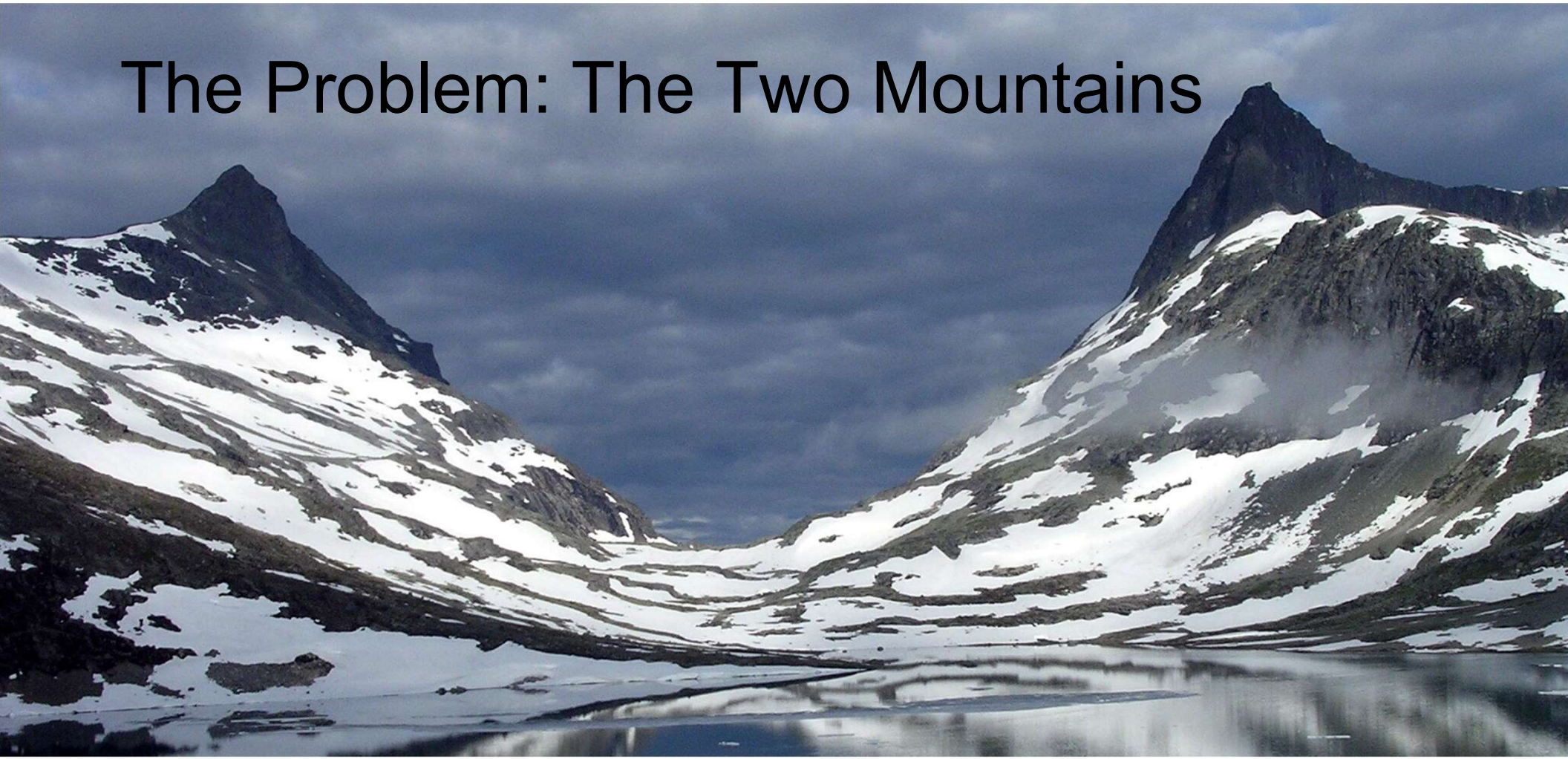
Objectives

- PBL as a learning tool for adult learners
- Introduce PBL strategies for basic immunology
  - Describe the educational pedagogy behind PBL
  - Identify the active learning component of a PBL tutorial
  - Explain strategies that tutors can use to facilitate learning in PBL
  - Identify and regulate common group concerns

The Problem: The Two Mountains



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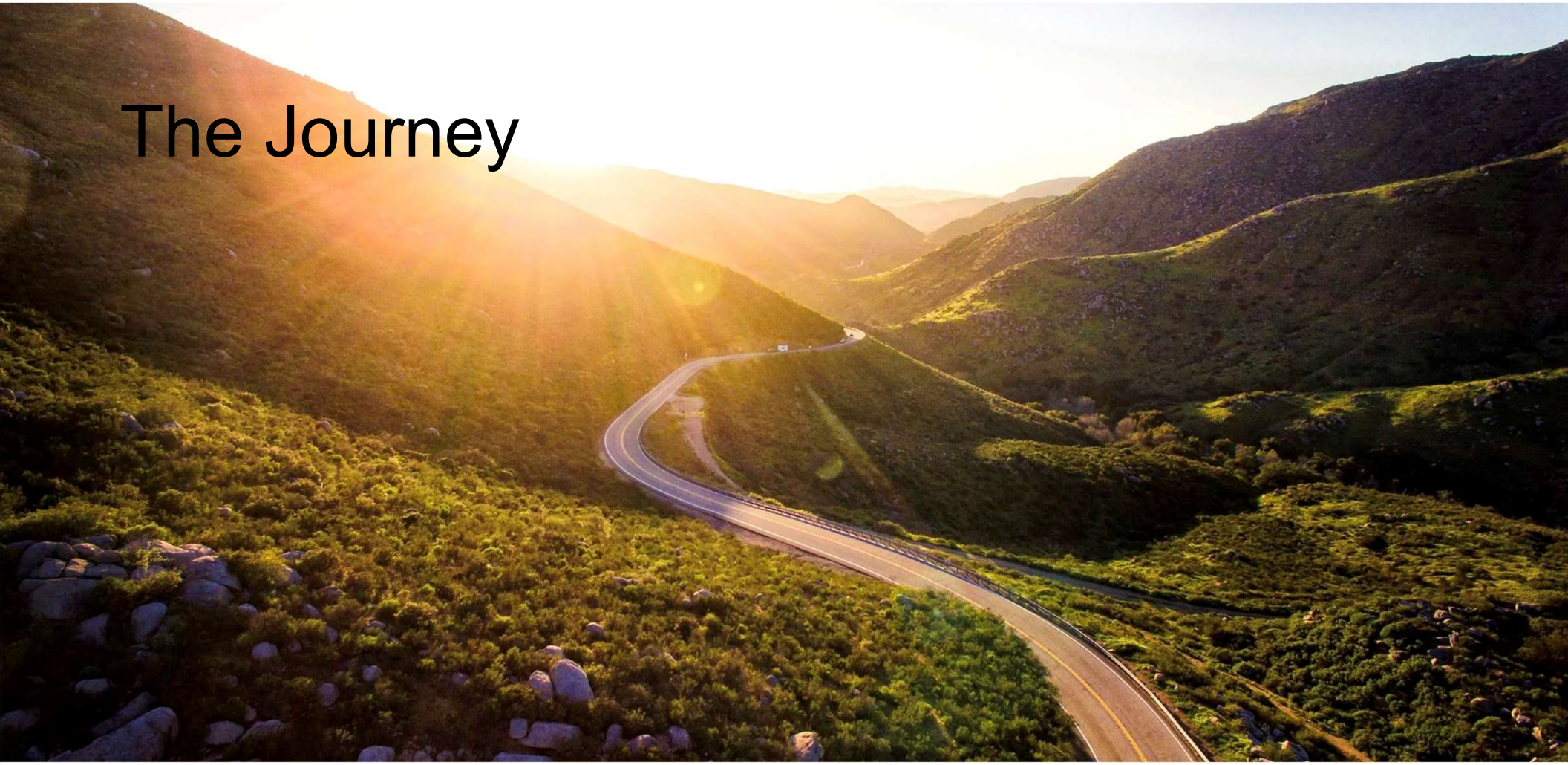
The Journey



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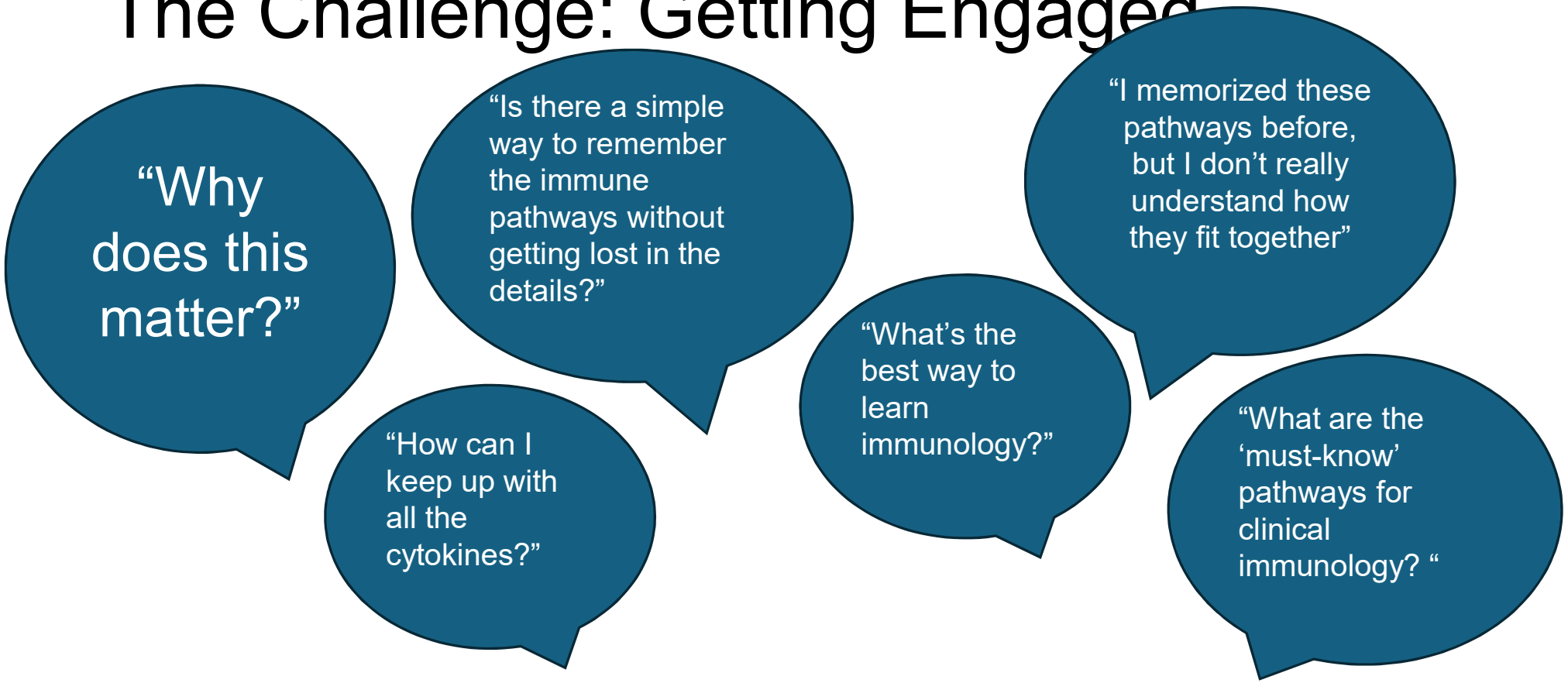
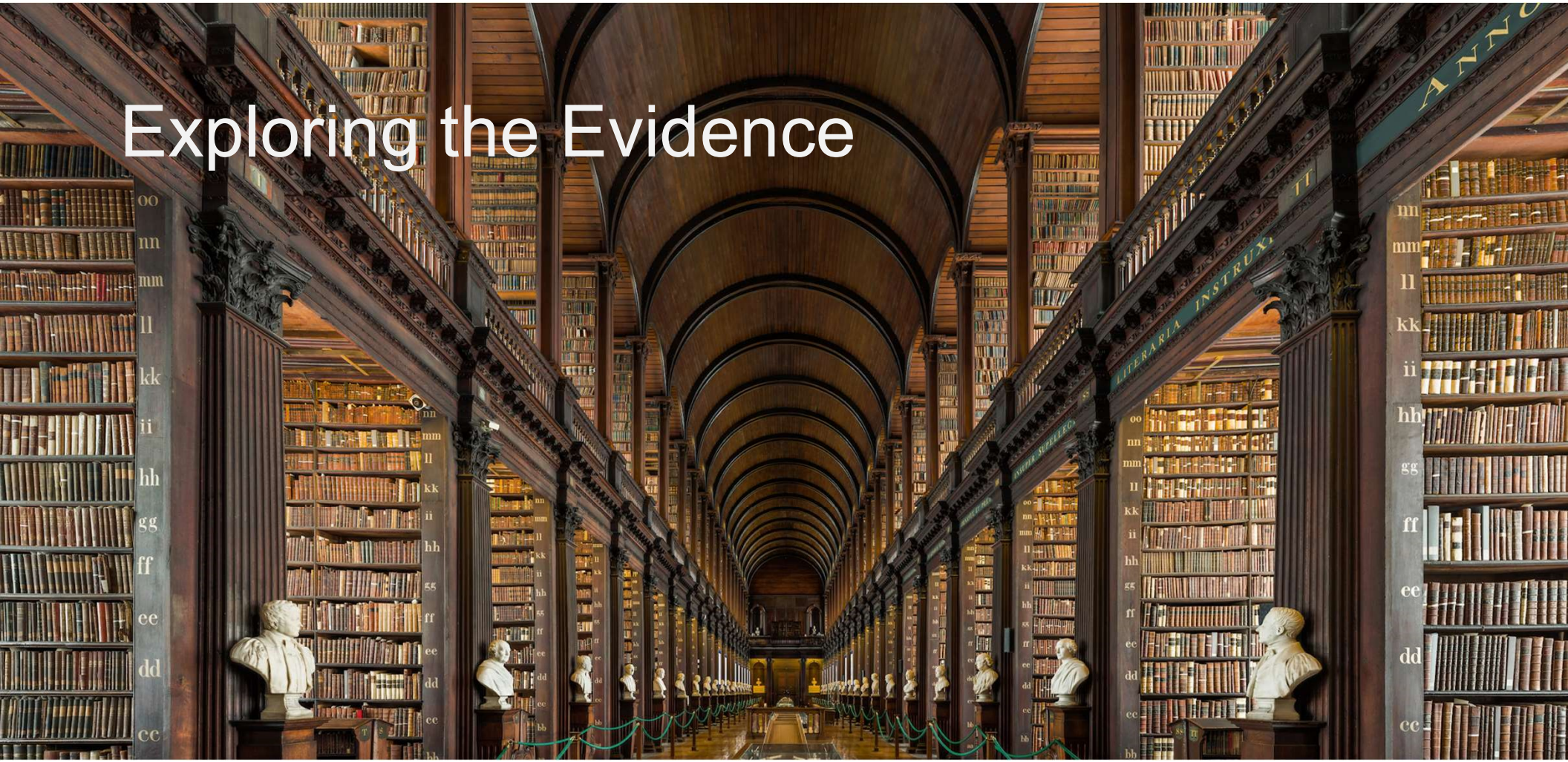
Disaster?

The Challenge: Getting Engaged



Exploring the Evidence



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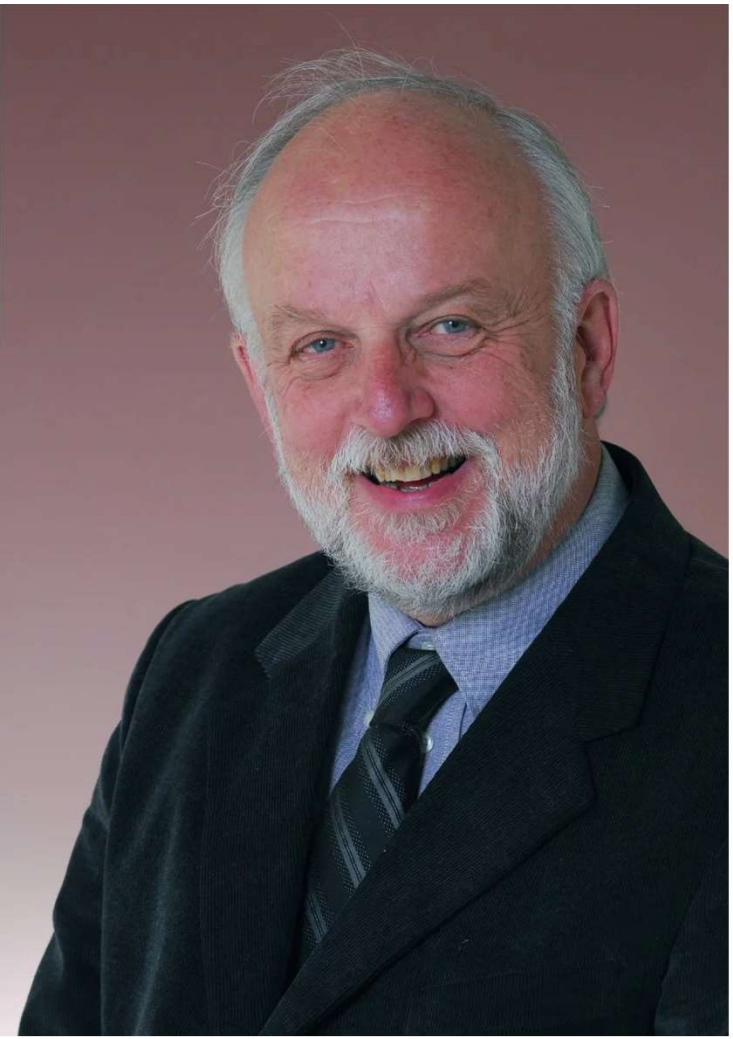
Google Scholar

Articles Case law

New! Save papers to read later

Stand on the shoulders of giants



Adv in Health Sci Educ (2012) 17:453–456
DOI 10.1007/s10459-012-9394-8

EDITORIAL

The basic role of basic science

Geoff Norman

…instruction in basic science requires specific pedagogical and assessment strategies that go far beyond the traditional 'read and regurgitate' approaches

PBL?

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Residents Survey

Needs to have a dedicated immunology curriculum

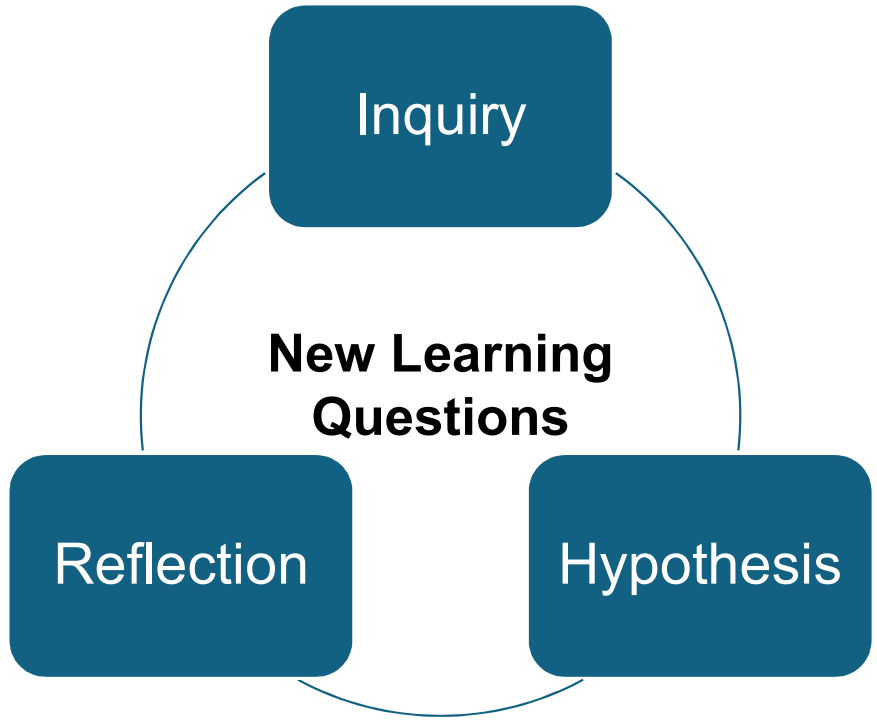
I found that the BI lectures organized and presented by the fellows was only helpful for teaching me the topics that I presented on. I learned very little from other presentations because there was not much to hold me accountable to that learning.

Case based teaching sessions led by staff are higher yield than wednesday afternoon BI lectures.

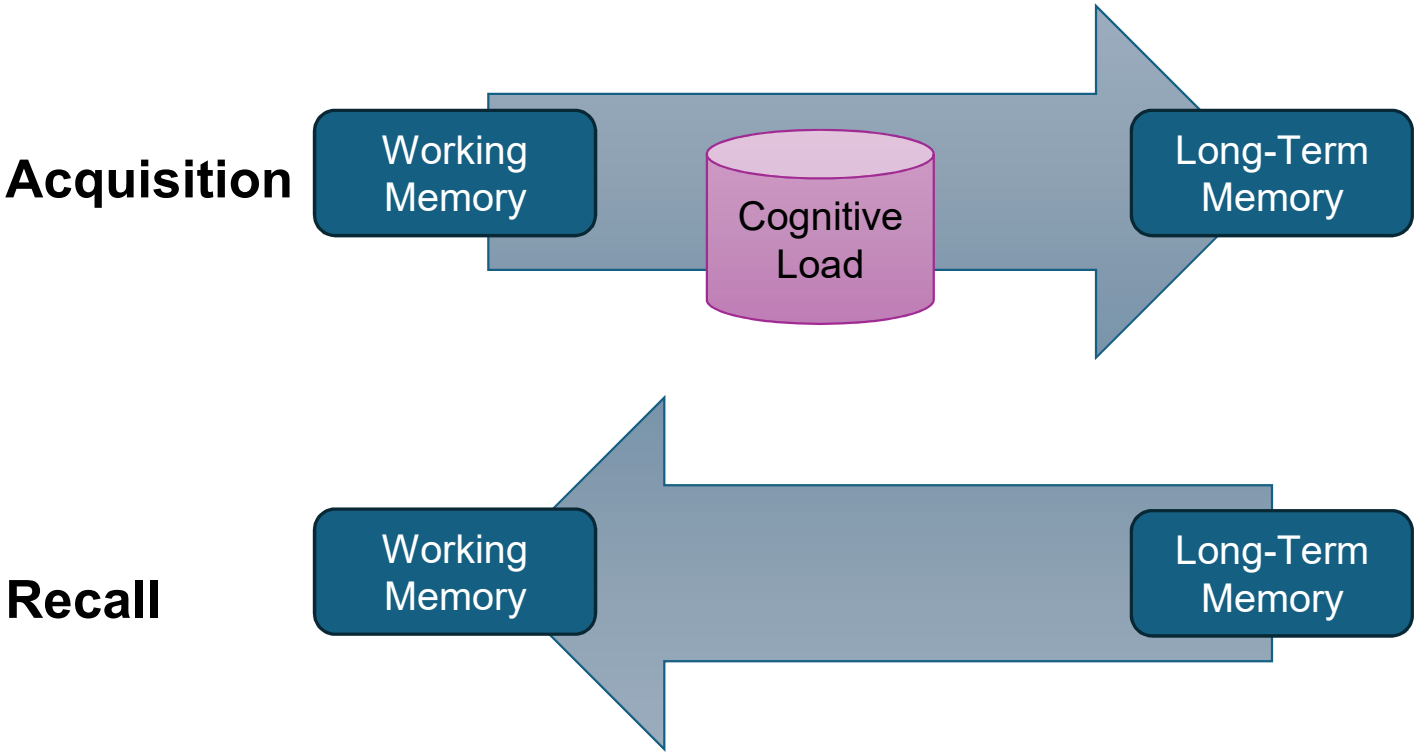
I found the training to be excellent for working from basic principles, but after being taught it was difficult to remember in the next weeks the things I had been taught. I should have been more proactive in taking notes, so that is largely a personal failure. If there was a basic resource tool like a small guidebook to help

Core principles and structure of PBL

- Scenario-based Learning
- Constructive Learning
- Small group collaboration
- Complexity



Knowledge Acquisition and Recall



Working Memory in Action: Try to memorize 7 words in 10 seconds

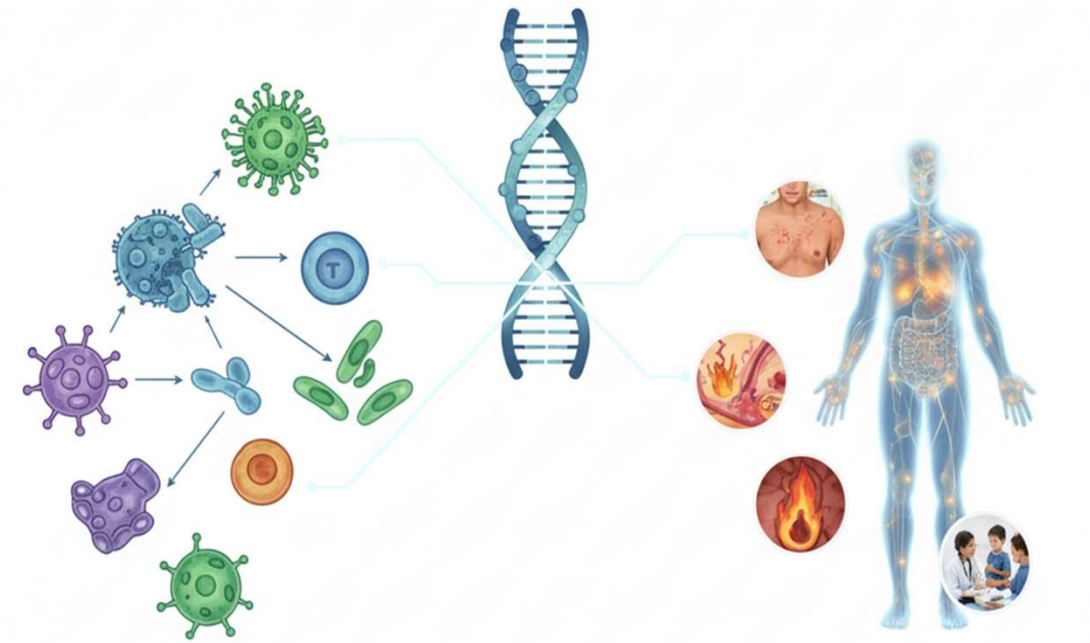
1. Apple
2. Train
3. House
4. Blue
5. Garden
6. Music
7. Light

Most people can only hold about 7 ± 2 items in their working memory at once.

Bruns HA et al. Out of the Curricular Shadows: Revolutionizing Undergraduate Immunology Education. Front Immunol. 2019
Stranford SA et al. Active Learning and Technology Approaches for Teaching Immunology to Undergraduate Students. Front Public Health. 2020

Why PBL suits Immunology

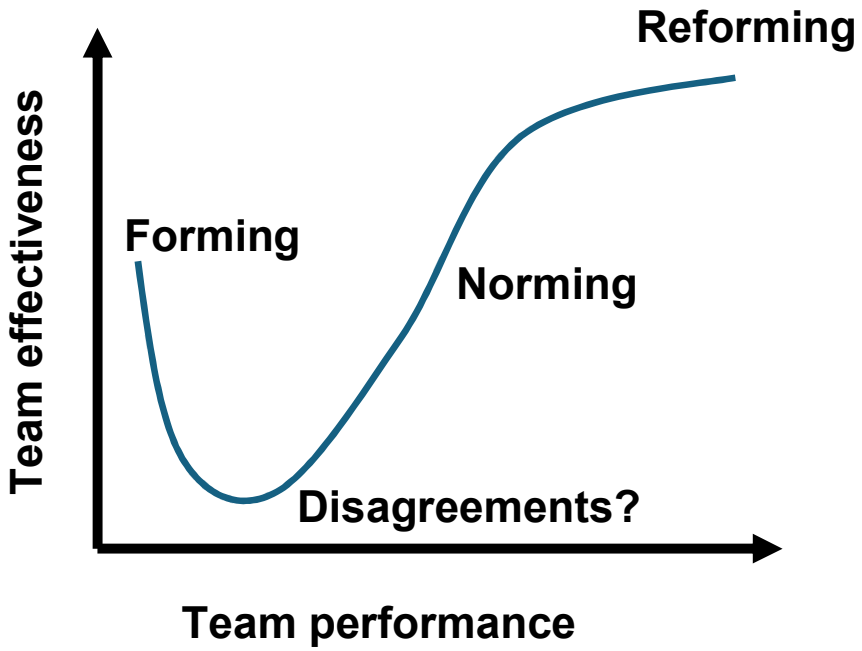
- Integration
- Clinical relevance
- Active engagement commits to memory
- Builds comfort with uncertainty



Basic Immunology PBL Cases

- Core immunology concepts (e.g., innate vs adaptive, cytokines, receptors).
- Matching complexity to learner level
- Based on the Canadian Allergy and Clinical Immunology Royal College objectives
- Real-world cases
- Questions about BI with clinical implications (Th2 inflammation and targeted asthma treatment)

What to anticipate



PBL cycle


Case
Brainstorming
Setting Objectives
(Scaffolded by Practice Question)
Take-Up
(Following Week)

Role of the tutor

Optimize Learning	Promote Group Function	Provide Experience and Wisdom
• Link to prior knowledge • Link to future context • Monitor cognitive load	• Feedback • Reflection	• Clinical cases • Anchoring narrative

First Tutorial Tips for Instructors

- Introduction and tone-setting
  - Set ground rules and expectations
  - Clear agenda
- Guide without instructing, ask prompting and probing questions
- Encourage discussion, hypothesis generation, and evidence-based reasoning
- Provide clinical pearls and anchoring narrative
- Seek and provide input and feedback

Questions to Promote Deep Learning

Clarifying Questions:

- "Can you explain what you mean by 'immune dysregulation'?"
- "What specifically makes you consider CVID over selective IgA deficiency?"

Probing Questions:

- "What's the mechanism behind that finding?"
- "How would you interpret a normal NK cell count in this context?"

Redirecting Questions:

- "Does anyone have a different perspective?"
- "How does that connect to the antibody deficiency we discussed earlier?"

Metacognitive Questions:

- "How did you approach learning about complement pathway disorders?"
- "What resources did you find most helpful and why?"

Key Principle: Ask, don't tell

Assessment and Feedback in PBL

- Two-way street

- Methods vary
  - Group presentations
  - Concept mapping and application exercises
  - Quizzes

- Collecting and acting on feedback to improve future sessions

Common Pitfalls and Solutions

- Typical challenges:
  - Dominant personalities
  - Insufficient or misdirected preparation
  - Staying on track
  - Time management
  - Group members who fail to contribute
  - Shallow analysis
  - Imbalanced priorities

Keys to Success

Preparation: Review cases thoroughly; anticipate objectives and misconceptions

Restraint: Resist the expert urge to teach, trust the process

Curiosity: Model intellectual curiosity and systematic thinking

Flexibility: Adapt to the group's learning needs and pace

Reflection: Continuously improve your facilitation skills

Outcomes and Looking Forward

- “Basic immunology still sucks, but it’s a good way to learn it”
- Improved knowledge scores, fellow engagement

- Plans for ongoing refinement:
  - Adapting cases
  - Expanding scope
  - Ongoing feedback and iteration

Q&A