Testing is Teaching

Andrew Binks, PhD
Associate Professor, Department of Basic Science Education

Emily M. Holt Foerst, PhD
Assistant Dean for Student Affairs
Director, Academic Counseling & Enrichment Services
Assistant Professor, Department of Basic Science Education

Give a man a fish, feed him for a day.
Teach a man to fish, feed him for life.

~Anne Isabella Thackeray Ritchie

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Success in Medical School
Attention & Metacognition
Short & long-term learning goals
Self-Efficacy
Sense of Belonging
Constructive Failure Attribution & Mindset
Cognitive Reappraisal Skills
Self-Awareness & Emotional Intelligence
Support System
Effective Cognitive Processing Habits
Wellness
(eat, sleep, mindfulness, exercise)
Thoughtful Schema Development

Learning Objectives

- Describe the potential positive impact of metacognition on learning behaviors.
- Describe barriers to implementing self-reflection in medical education.
- Determine how barriers to developing self-reflective processes can be overcome.
- Identify ways to incorporate learner self-reflection into development of curriculum, assessment and faculty.

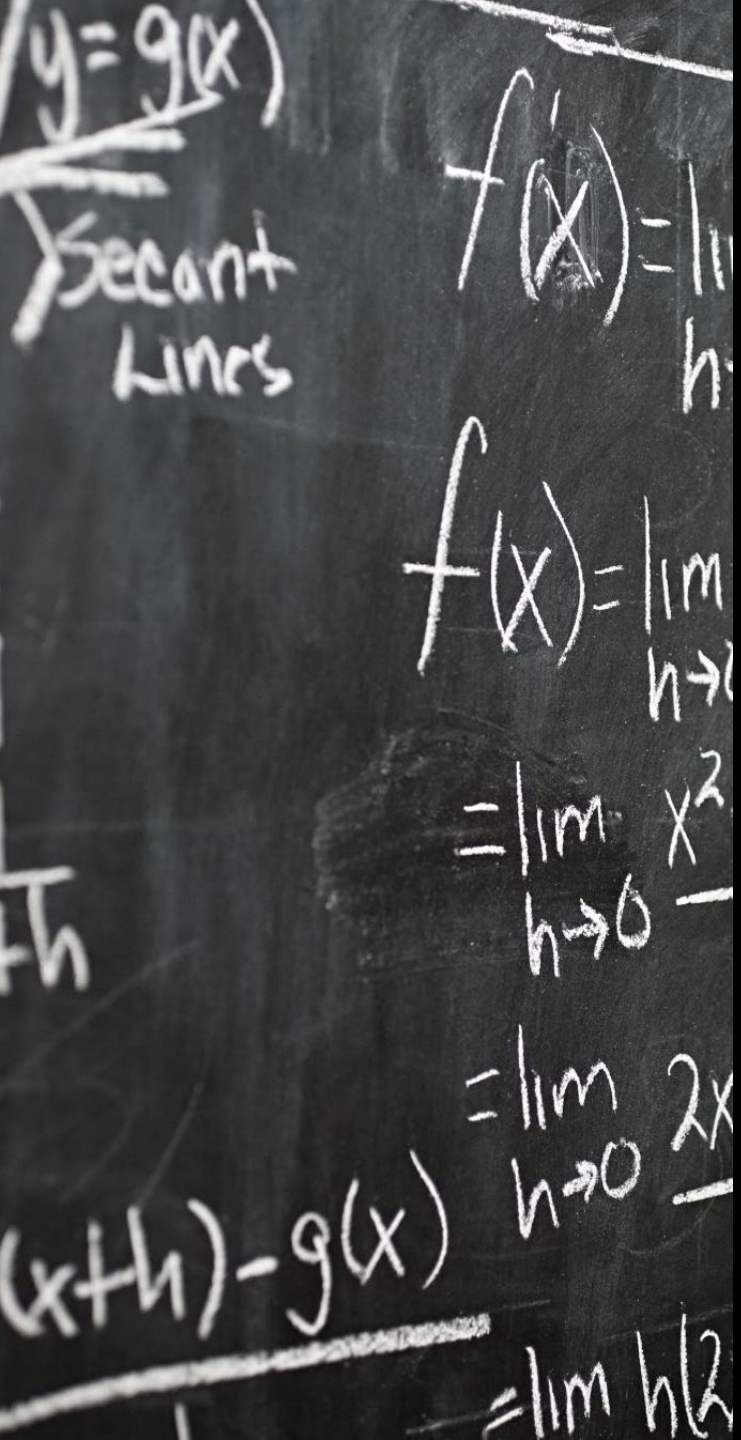
Who is a Self-Regulated Learner?

A learner with a proactive approach to their learning experience.

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory into Practice*, *41*(2), 64–70. https://doi.org/10.1207/s15430421tip4102 (page 67)

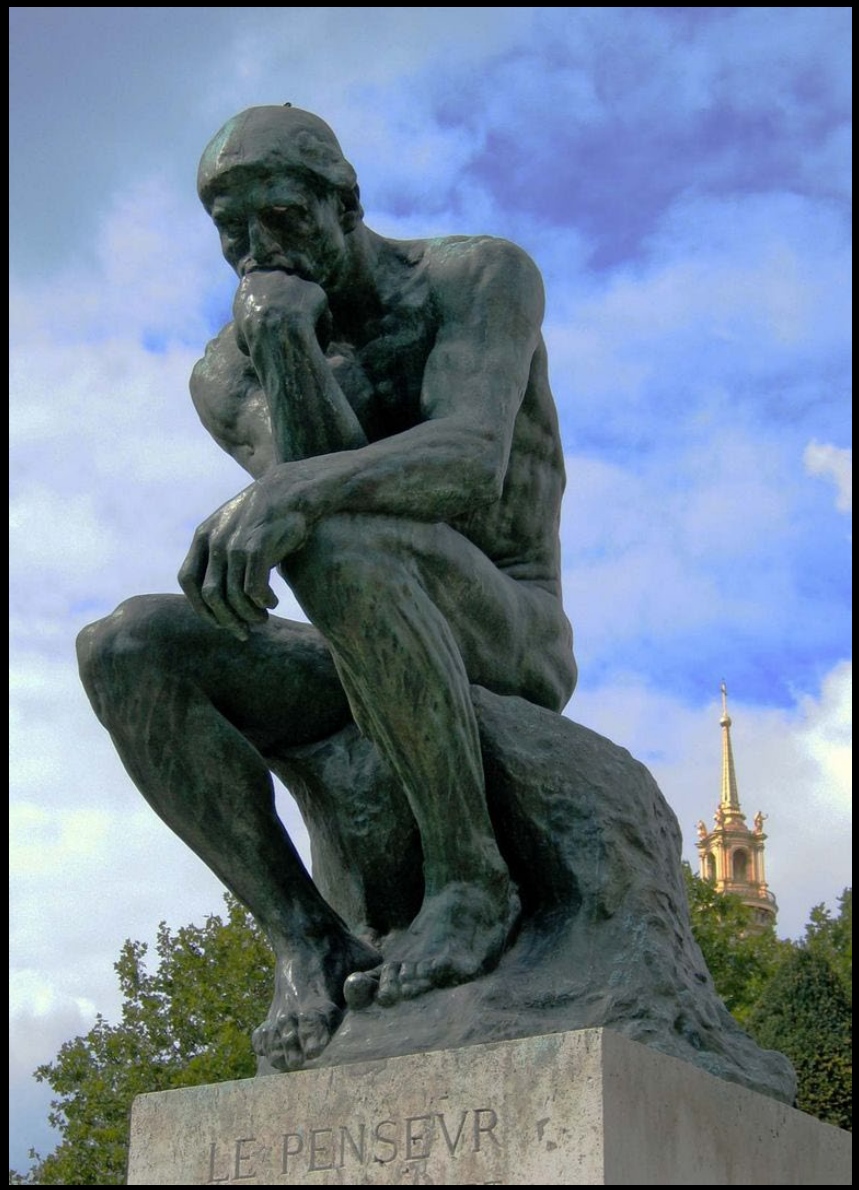
Traits of a Self-Regulated Learner

- Self-Aware
- Self-Motivated
- Ability to set proximal goals in learning
- Ability to identify appropriate learning strategy for given goal
- Self-Monitoring skills
- Reflection on own performance
- Willing to adjust strategy as needed for improved future performance
- Self-Evaluation of performance
- Adapt as needed
- Manage time appropriately to make all this possible



Step 1… Metacognition

How one moves from being a "cognitively passive learner[s] to cognitively active learner[s]"
(Zakrajsek, 2022, p. 96)



Thinking about Learning

Photo Credit: britannica.com

Metacognitive Regulation Building Blocks

TASK AWARENESS

STRATEGY AWARENESS

PERFORMANCE AWARENESS

Alvermann, D. E., Phelps, S. F., & Ridgeway, V. G. (2007). *Content area reading and literacy* (5th ed.). Boston. Pgs 350-352

Task Awareness Questions

WHAT ARE MY GOALS WHEN LEARNING?

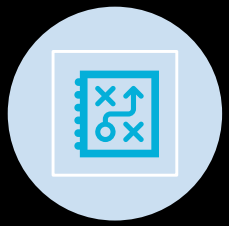
WHAT DO I KNOW ABOUT THIS TOPIC ALREADY? (NOVICE, INTERMEDIATE, EXPERT)

IS THIS A TOPIC I STRUGGLE TO UNDERSTAND? CAN I PINPOINT WHY I STRUGGLE WITH "X" TOPIC?

Alvermann, D. E., Phelps, S. F., & Ridgeway, V. G. (2007). *Content area reading and literacy* (5th ed.). Boston. Pgs 350-352

Strategy Awareness Questions

What strategies have worked for my brain when learning new data in the past?



Which resources align best with the strategies I want to employ?

How do I **organize** this material?

Which strategies do I want to apply to different types of information I need to learn?

Alvermann, D. E., Phelps, S. F., & Ridgeway, V. G. (2007). *Content area reading and literacy* (5th ed.). Boston. Pgs 350-352

Performance Awareness Questions

Can I successfully recall and/or apply the material on practice questions?

When I struggle with a topic, do I modify how I try to learn it or mentally flee the scene?

Do I strive to learn from my knowledge gaps in formative moments?

What type of mistakes did I make on the formative exam(s)? Why?
Do I need to tinker with my current strategy for a given topic?

Alvermann, D. E., Phelps, S. F., & Ridgeway, V. G. (2007). *Content area reading and literacy* (5th ed.). Boston. Pgs 350-352

Potential Positive Impact of Metacognition on Learning

Patel et. Al. (2015)

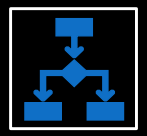
Medical Students
N = 55

5-year qualitative (Thematic Analysis) **study.**

Interviews with students who remediated

University of Leicester

University of Nottingham



4 Maladaptive themes Patel Et. Al. contend lead to a Cycle of Failure:

Problematic goals & strategies

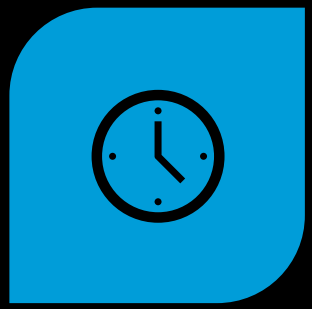
Not seeking and/or accepting support

Normalizing failure & attributing it to external causes

Protecting self-worth

Patel, R., Tarrant, C., Bonas, S., Yates, J., & Sandars, J. (2015). The struggling student: A thematic analysis from the self-regulated learning perspective. Medical Education, 49(4), 417–426. https://doi.org/10.1111/medu.12651

Barriers to Implementation



TIME

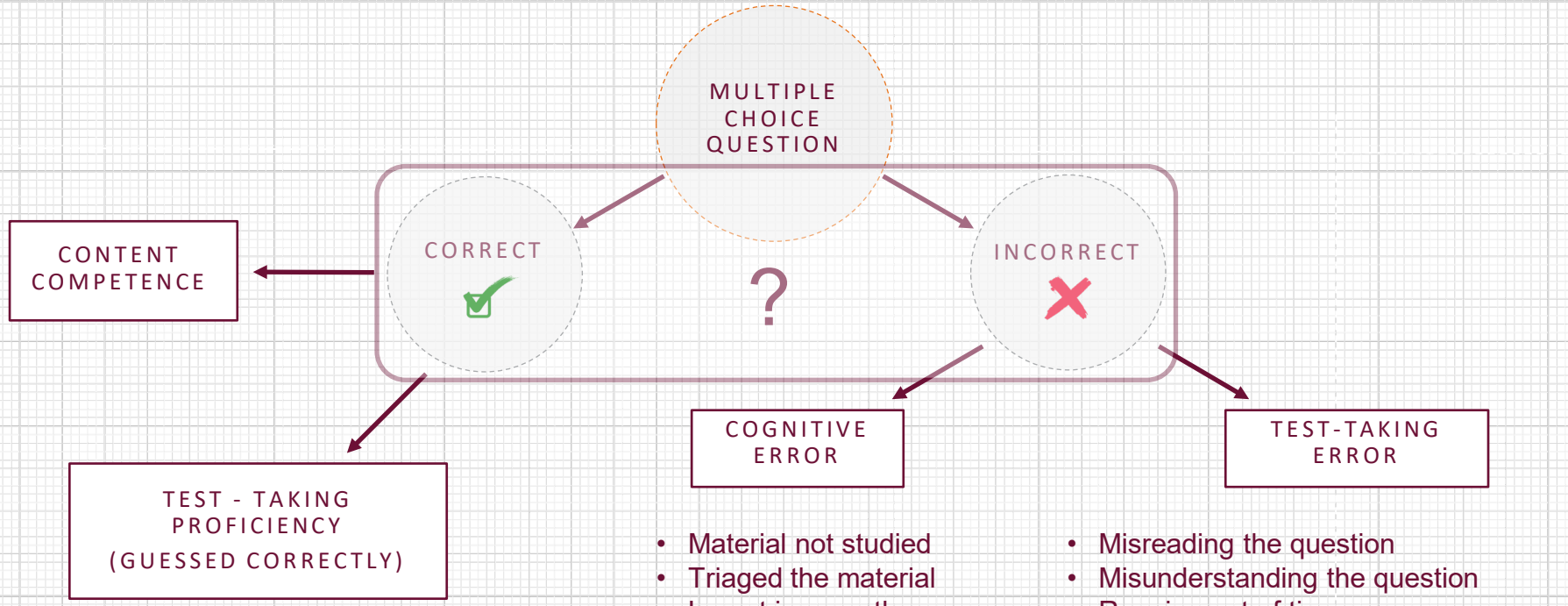
POOR UNDERSTANDING OF ITS VALUE

MINDSET

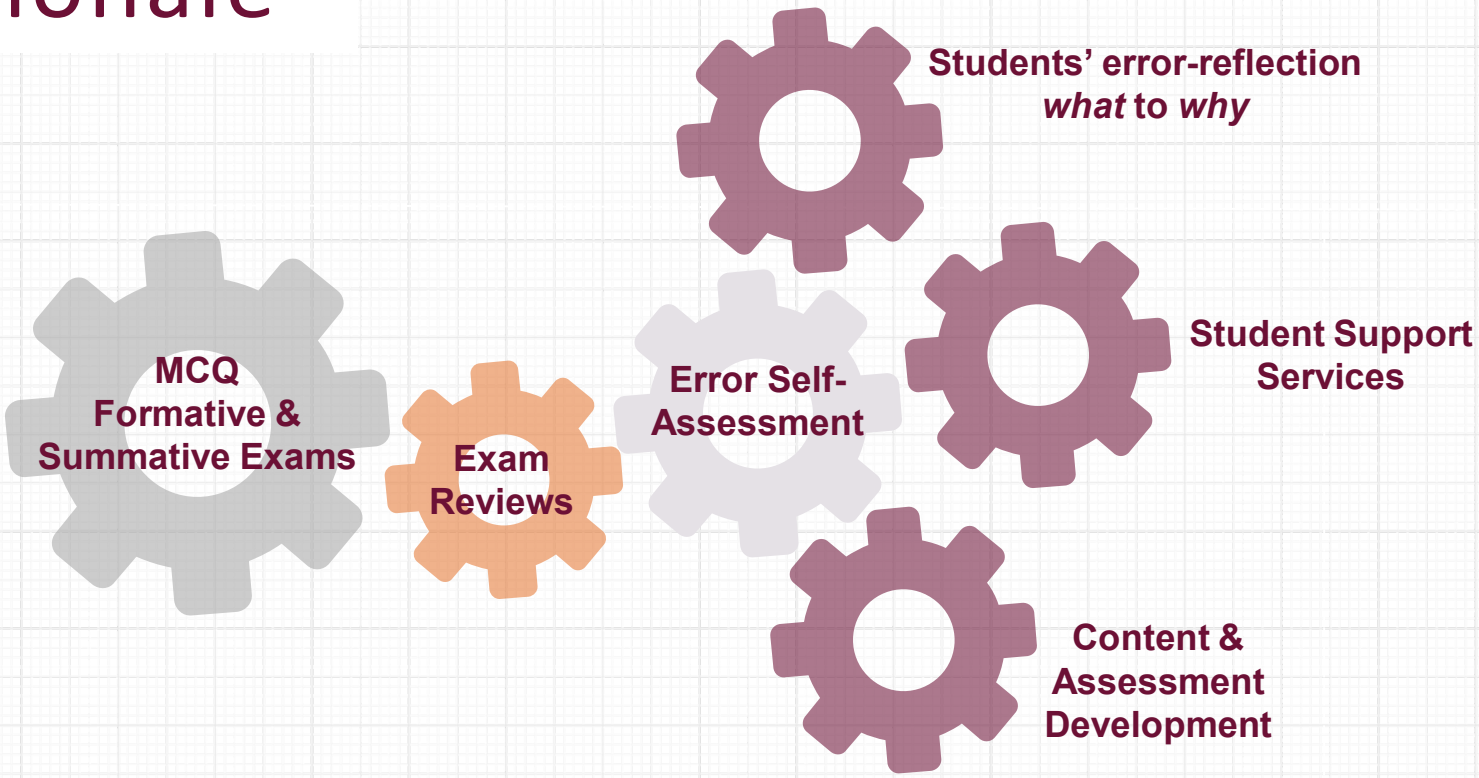
Overcoming Barriers

- Time spent on the front end is an overall time-saving measure.
- Incorporate metacognitive questions into learning moments to help students experience benefit and develop the habit.
- Developing a growth mindset in learners by promoting the importance of learning prior suboptimal learning opportunities (e.g., mistakes).

Changing the ‘what’ to ‘why’



Rationale


Students' error-reflection
what to *why*
MCQ
Formative &
Summative Exams
Exam
Reviews
Error Self-
Assessment
Student Support
Services
Content &
Assessment
Development

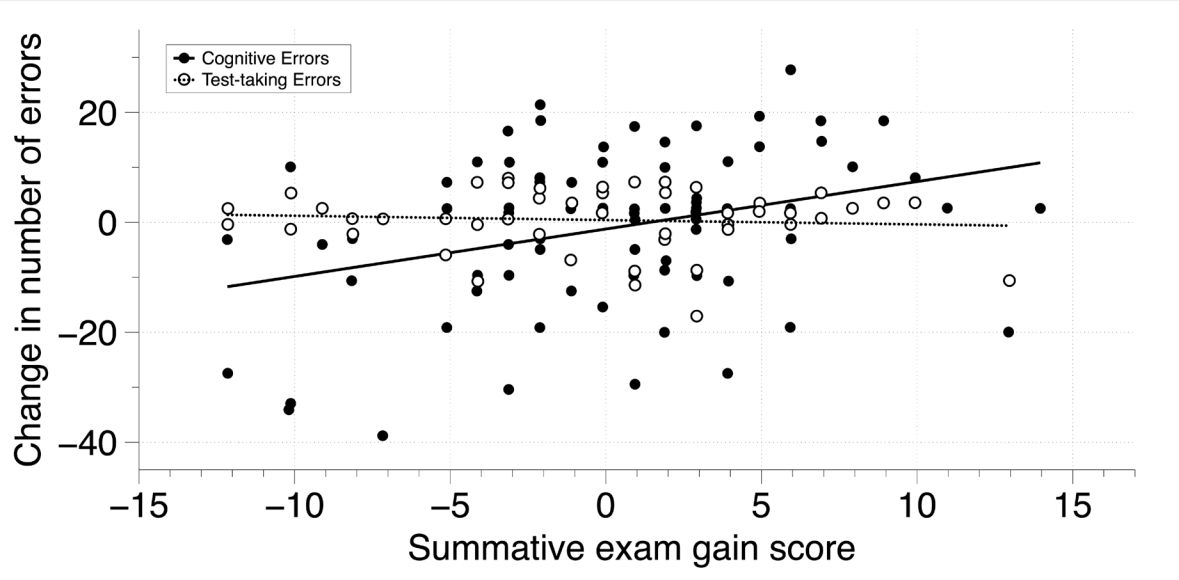
Error Reflection Method (ERM)

Type 1	I misread the question
Type 2	I misunderstood the question
Type 3	I ran out of time / skipped the question
Type 4	I changed my answer to the wrong option
Type 5	I never saw this material before
Type 6	I learned this incorrectly
Type 7	The content looked familiar but I couldn't determine the correct answer
Type 8	I triaged studying this content
Type 9	I was convinced my answer was correct
Type 10	Other

1) Exam Post-Mortem and Error Analysis, UNBC Academic Success Center, 2013
2) M.F. Nolan, Medical Science Educator, Vol.25 (1), pp61-68, 2015

More Reflection More Gain

Increases in reported cognitive errors in formative assessments (increased self-reflection) were associated with increased gain score on subsequent summative assessments



(R = 0.3404, p = 0.002).

What type of errors do medical students make?

Cognitive errors > Test-taking
(p <0.001, t-test)

Test-taking errors

1-in-4 errors were test-taking errors
Inconsistent with learner perception

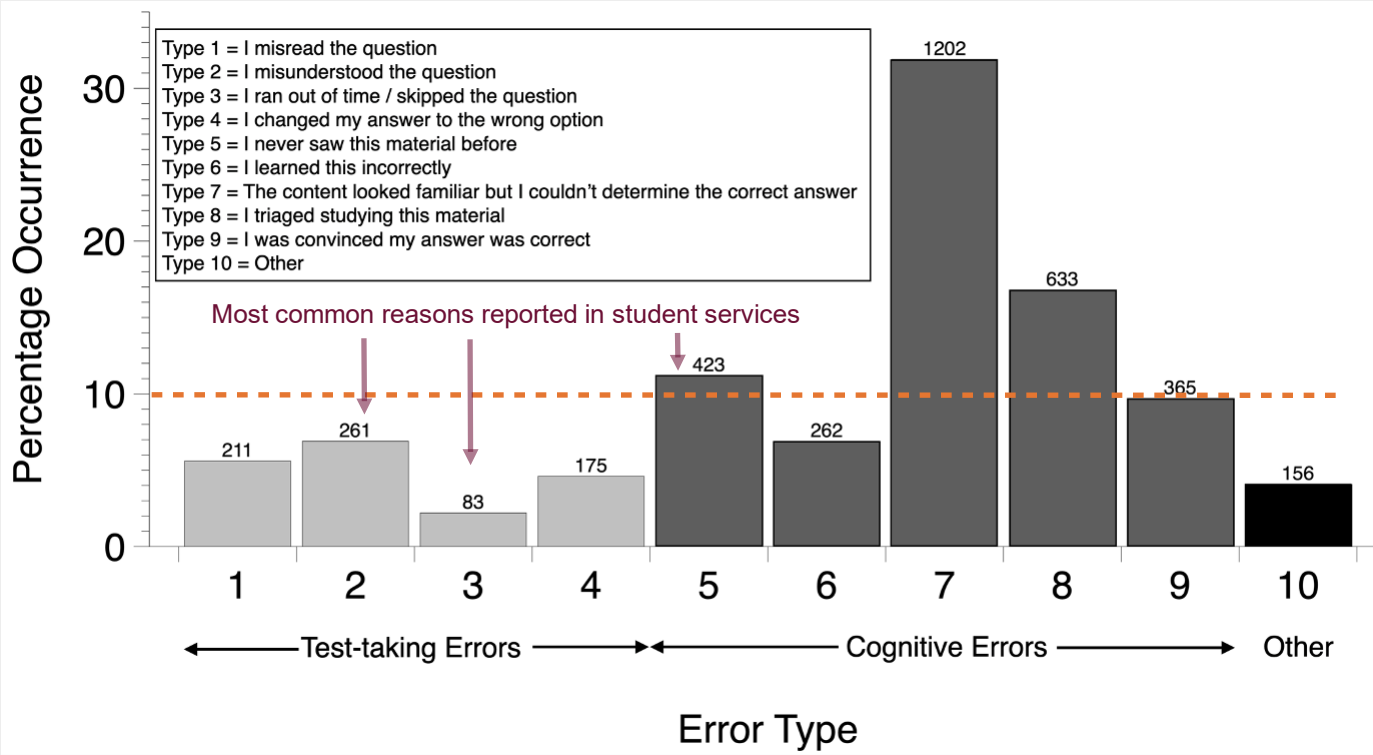
Cognitive errors

#5: I never saw this material before - *triaged material or poor study planning/behaviors*

#7: The content looked familiar but I couldn't determine the correct answer - *shallow learning behaviors*

#8: I triaged studying this content

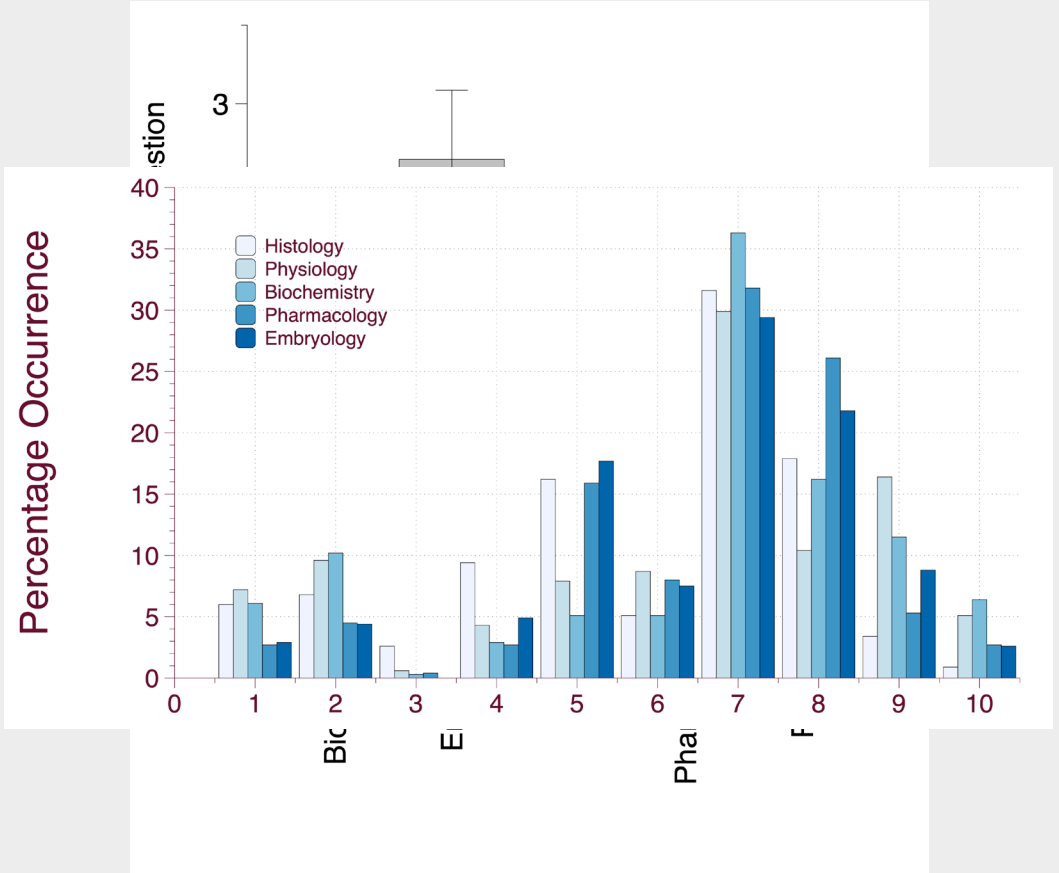
#9: I was convinced my answer was correct - *learning illusion*



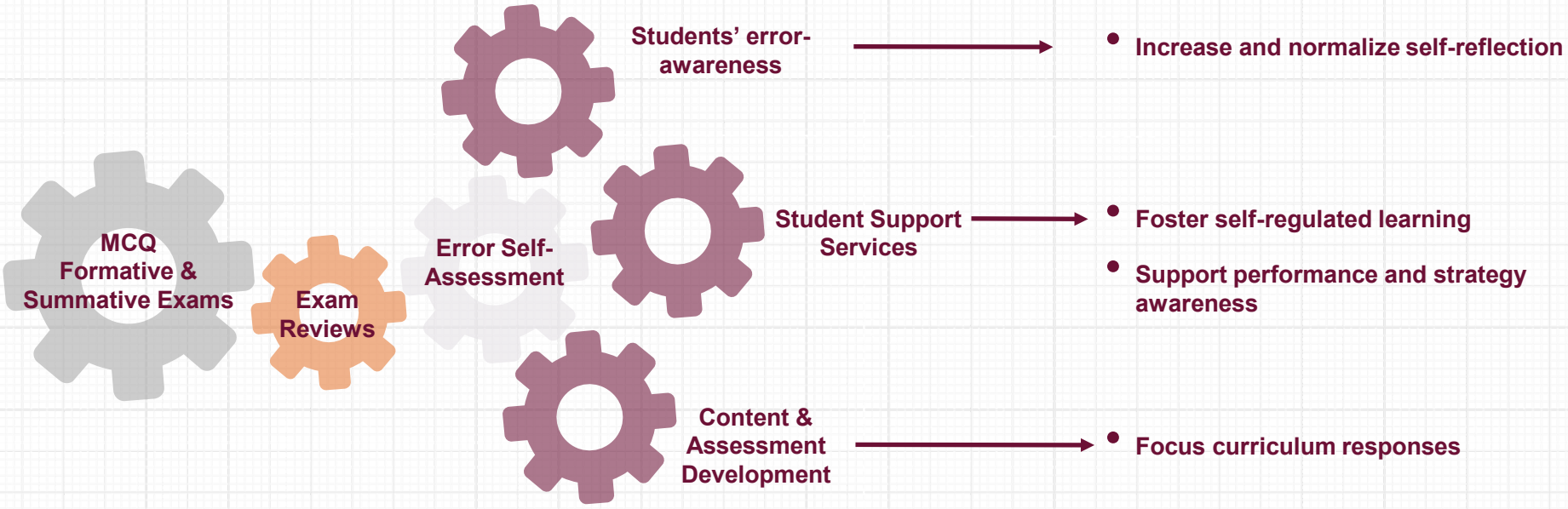
Errors by discipline

#8: I triaged studying this content

Summative exam performance for Pharm and Embryo was good!



Uses of the ERM



Name: _____ Date: _____ Block: _____ Domain: _____ Exam Reviewed: _____

Error Reflection Method

Instructions: For each question you marked with an incorrect answer, please select the type of error you think you made from the table below. Completion of this worksheet is intended to help support your learning process and knowledge base development by illuminating why questions were missed. Please connect with faculty for content-related questions and/or with Emily Holt Foerst, PhD to talk through learning & cognition questions.

Type 1	I misread the question
Type 2	I misunderstood the question
Type 3	I ran out of time/skipped the question
Type 4	I changed my answer to the wrong option
Type 5	I never saw this material before
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Type 8	I triaged studying this material
Type 9	I was convinced my answer was correct
Type 10	Other

Question Number/Identifier	Error Type

Question Number/Identifier	Error Type

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Reference: Andrew P. Binks, R. Brock Mutcheson, Emily M. Holt & Renée J. LeClair (2022): A Simple and Sustainable Exercise to Enhance Student Self-Reflection on Error-Making, Focus Support, and Guide Curricular Design, Teaching and Learning in Medicine, DOI: 10.1080/10401334.2022.2033981 To link to this article: https://doi.org/10.1080/10401334.2022.2033981

Thank You!