"Metacognition and Self-Directed Learning"

Some fundamentals that can improve all learning, ~

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Intro

- Objectives: we hope you can …

  - Define metacognition

  - Identify components of a cycle that represent a basic metacognitive process

  - Create a list of strategies for incorporating metacognition into your courses

  - Be inspired to consider strategies for incorporating metacognitive reflection into your teaching practices
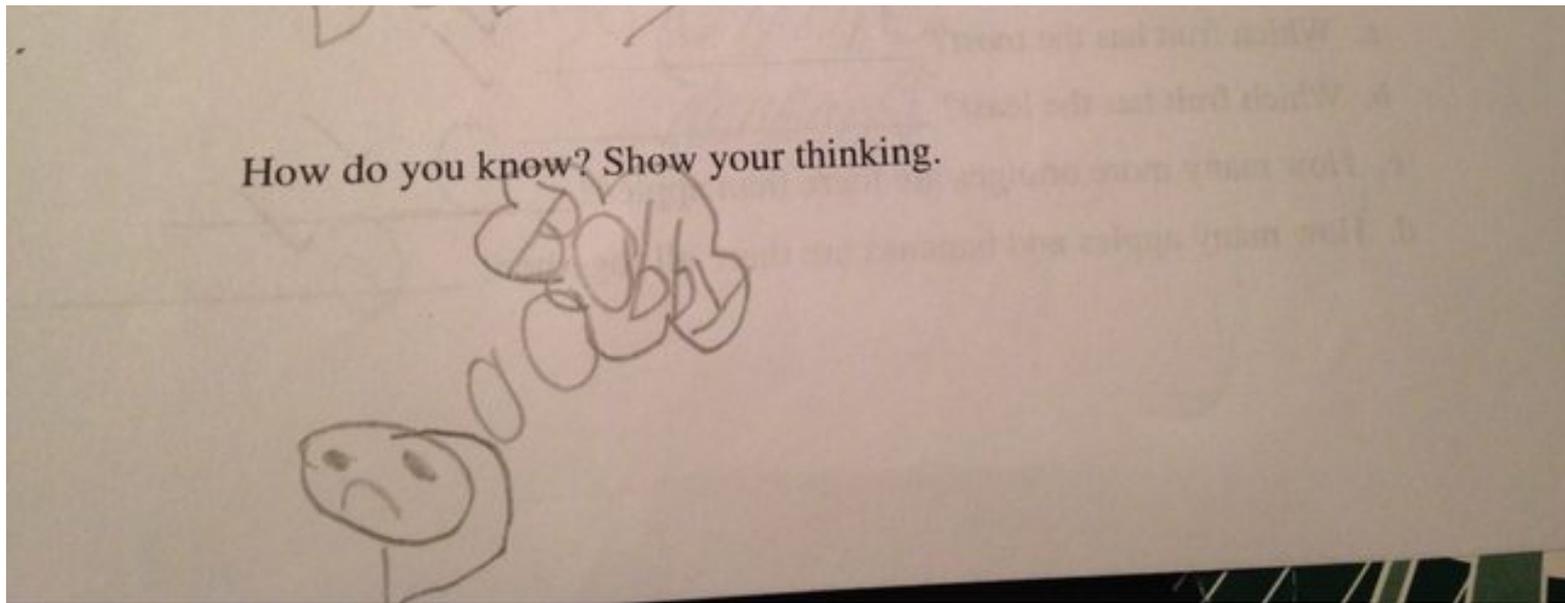
In this session, participants are asked to consider:

1. Your own experience with metacognition, in the present and in the past

2. How you can incorporate student metacognition into the course(s) you're teaching

What is Metacognition?

"The process of reflecting on and directing one's own learning"
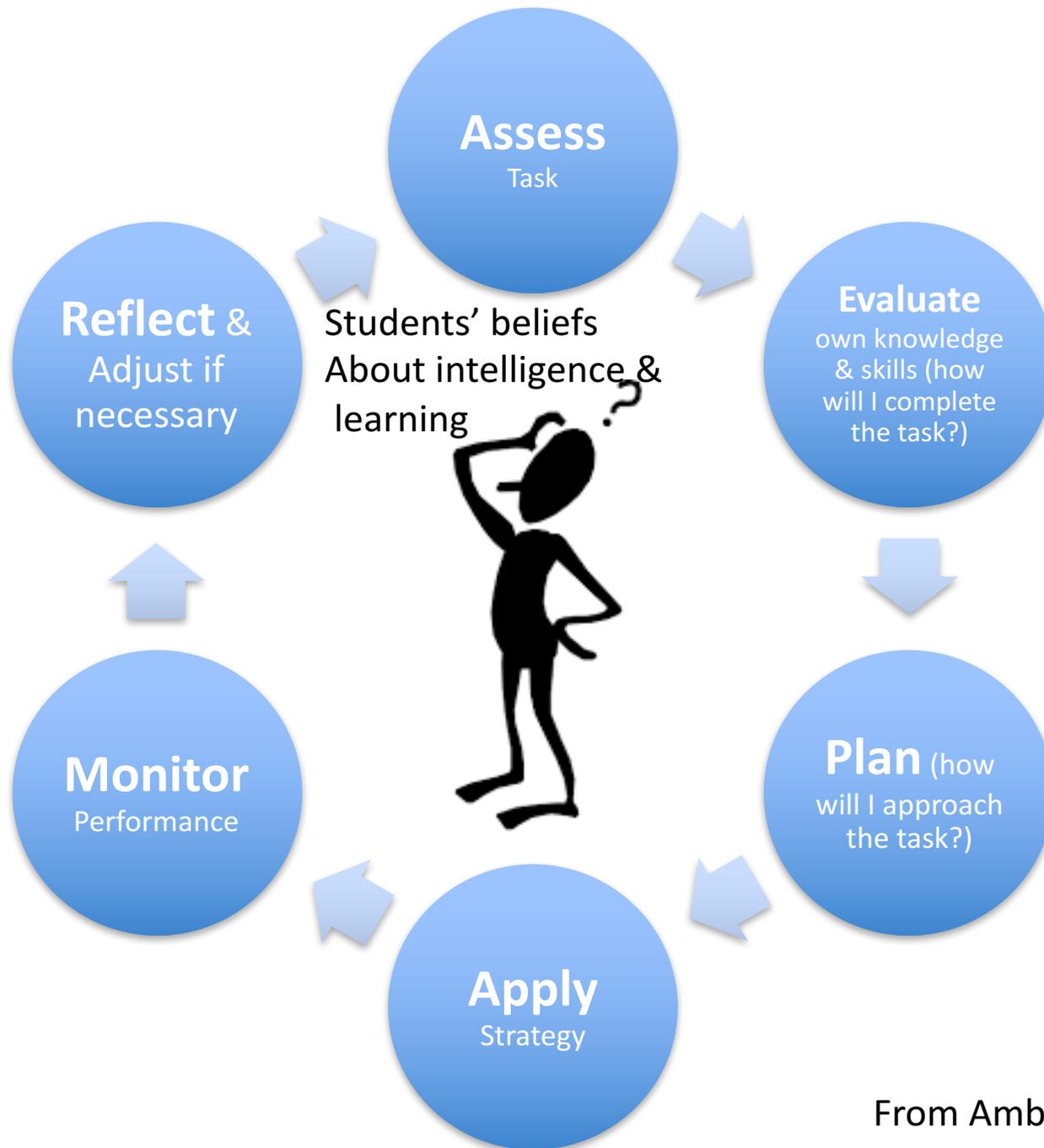
(National Research Council, 2001)

How do you know? Show your thinking.

Cognition vs Metacognition in Practice

Cognitive Questions	Metacognitive Questions
• Explain why this phenomena happened	• How much time does this assignment take? (assess the task)
• Justify why is this statement important?	• What are the requirements for this assignment? (assess the task)
• Predict what would happen if the temperature increases?	• What are the gaps in my knowledge? (evaluate)
	• How would I plan for my study? (Plan)
	• What strategies should I use? (Apply)
	• Is the strategy working well so far? (Monitor)
	• Am I making good progress? (Reflect)
	• Should I change the approach? (Adjust)
	• What would I do differently next time? (Adjust)

Cognitively challenging tasks outside your discipline: Instructions

Pick a puzzle

- Person #1: Tackle your task, **talking aloud about your thought process** as you do so.

- Person #2: Take notes on what Person #1 is saying/thinking

- After 2 minutes, you will switch.

Assess
Task

Evaluate
own knowledge
& skills (how
will I complete
the task?)

Plan (how
will I approach
the task?)

Apply
Strategy

Monitor
Performance

Reflect &
Adjust if
necessary

Students' beliefs
About intelligence &
learning

From Ambrose et al., 2010

How you learned to be metacognitive in your discipline –**wksh Q1**

Think back to when you were in school:

1. Were you ever given explicit advice about how to learn or about how to be metacognitive?

2. How have you changed as a learner over time?

3. What factors or people improved or impeded your learning?

Discussion Question

Metacognition:

- Where does it appear in your students' courses or programs?

- Is it ever mentioned/assessed/built?

Where do we see metacognition built in to courses/programs?

How can we promote student metacognition?

- What strategies could you use/have you used to help students:

1. Assess Task
2. Evaluate Skills
3. Plan Approach
4. Monitor
5. Reflect

Explicit metacognitive activities

- **Preassessments** – encourage students to examine current thinking

- **Muddiest point** – practice in identifying confusions

- **Retrospective post-assessments** – pushing students to recognize conceptual change

- **Reflective journals**

Deliberate Practice steps (tips)

1. **Approach** each critical task with an explicit goal of getting much better at it.

2. **As you do the task**, focus on what's happening and why you're doing it the way you are.

3. **After the task**, get feedback on your performance from multiple sources. Make changes in your behavior as necessary.

4. **Continually** build mental models of your situation - your industry, your company, your career. Enlarge the models to encompass more factors.

5. Do those steps **regularly**, not sporadically. Occasional practice does not work.

http://archive.fortune.com/magazines/fortune/fortune_archive/2006/10/30/8391794/index.htm

Examples of integrating metacognition into course activities

- Pair discussion after a clicker Q

- Active-learning tasks and/or homework assignments

- Preparation for quizzes/exams
  - Knowledge surveys

- Reflection after homework/quiz/exam
  - wrappers

Pair discussion after a clicker Q prompts

- Share how you thought about what the questions was asking

- What was your main reason for choosing your answer, and what were the main reasons you did not choose each of the other answers?

- What was most confusing to you about this question?

Active-learning tasks and/or homework assignments

- Ask 3 questions that you had abut the concepts you explored in your assignment that you still can not answer

- Describe at least 2 ideas related to this assignment that you found confusing

- How was the way you approached completing this assignment different compared with the last time we had an assignment like this?

Preparation for quizzes/exams

- How do you plan on preparing for the upcoming exam? Why?

- What resources are available to support you? How will you make sure to use these?

- How does your strategy for exam preparation compare with at least 3 colleagues in your class/lab? Ask them.

Strategic Resource Use for Learning: A Self-Administered Intervention That Guides Self-Reflection on Effective Resource Use **Enhances** Academic Performance

- Patricia Chen et al., 2017

Strategic Resource Use for Learning Checklist
Please select the Stats 250 resources that you think will help you prepare for Exam 2 effectively.

- ☐ Lecture notes
- ☐ Video captured lectures (Blue Review)
- ☐ Past required HW problems
- ☐ Past recommended HW problems
- ☐ Practice exam questions (from lab workbook)
- ☐ Past exam questions through Problem Roulette
- ☐ Name That Scenario Applet
- ☐ Lab materials (ILPs)
- ☐ Textbook readings
- ☐ Yellow formula card
- ☐ Discussions with other students in the class (e.g. study group)
- ☐ Office hours held by a lecture instructor
- ☐ Office hours held by GSIs
- ☐ Asking questions in class
- ☐ Private tutoring

Self-Reflection on Learning Scale

Different students have different approaches to the same class. We are interested in how you personally approached this Stats 250 class.
Please tell us how often you engaged in the following behaviors in this class.

- 1. On each assignment I was given, I carefully considered what the instructor expected of me as a student.

- 2. I actively tried to find out what was expected of me to get good grades in this class.

- 3. As I studied for the class, I kept monitoring whether or not the way I was studying was effective.

- 4. I actively evaluated how well certain study techniques were working for me in this class.

- 5. When I was stuck on a problem, I changed my approach rather than continuing to work on it the same way.

- 6. Whenever I got stuck on a problem, it was easy for me to switch to a different way of thinking about the problem.

- 8. After each exam, I thought about how my performance in class was a result of how I had been doing things.

Example Excerpts from "Why Useful" Open-Ended Responses and Students' Plans

- Student A: Lecture notes, past HW problems, practice exam questions: these will be helpful for me because I can see the steps necessary for completing a problem and I can practice doing the problems with a guide (my lecture notes) and follow the steps on those until I can do them without using my lecture notes / Yellow formula card: I need to become more familiar with the card so I know where certain equations are when I get to the test I know what equations I need for each type of problem / Discussions, private tutoring: These will help me to verbally talk through my problems so that I can make sure I know what I am talking about when I do the problems on my own

Meta-Metacognition … on your thinking about your thinking during this session

- What was most intriguing to you about today's topic?

- What are you thinking about in terms of how you might use those ideas?
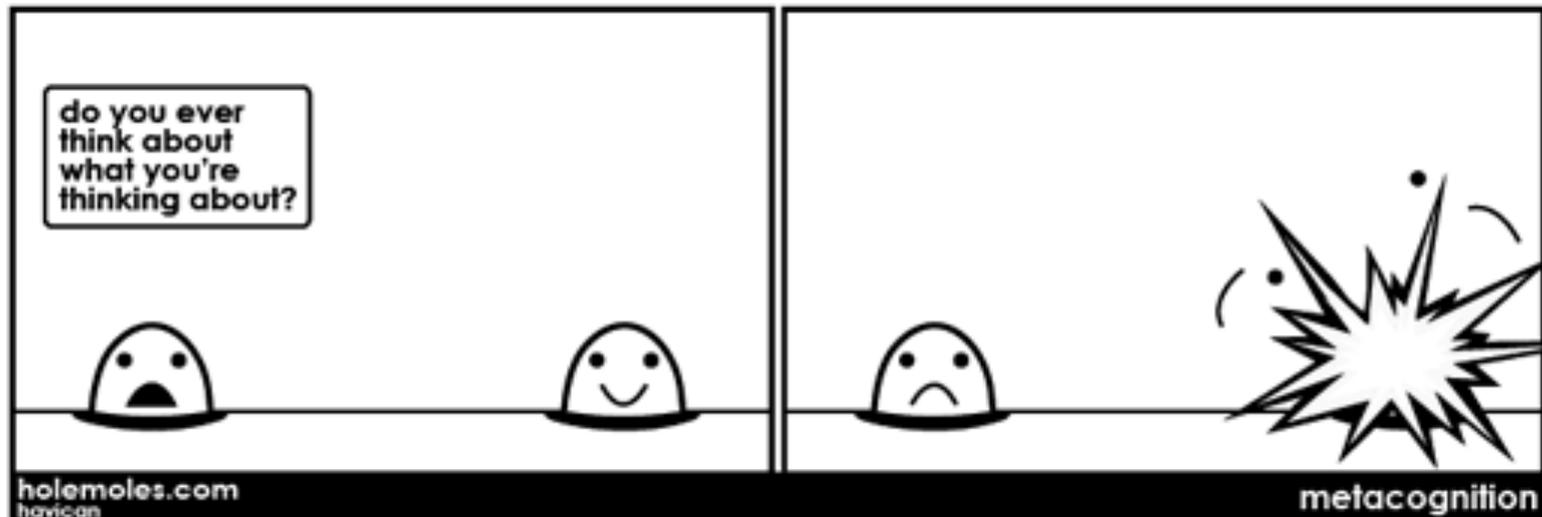
How learning works

Components in each of 7 chapters

- Contexts; two short scenarios

- What's going on in each?

- What principles of learning are at work?

- What does research say about these principles?
  - Subsections …

- Implications of that research

- What strategies does research suggest?
  - Subsections …

- Summary

Also 8 specific appendices with concrete recommendations