Reflection and Metacognition Series
PART 2: Integrating Reflection for Students

What is metacognition?
Simply put, metacognition is "thinking about thinking." Complex and multi-dimensional, scholars posit that metacognition is comprised of two main components: the knowledge and regulation of cognition (Metgzer et al., 2018; Schraw et al., 2006). Having awareness of how one learns, one's strengths and deficits, and the benefits of situational learning strategies contribute to "knowledge" about cognition. While regulation of cognition consists of actively engaging in one's own learning process through planning, monitoring, reflecting, and strategizing (Metzger et al, 2018; Schraw & Dennison, 1994; Tanner, 2012). This is a type of intentional learning that interacts with active inquiry, whereby students both reflect on and direct their learning (National Research Council, 2000).

Why does metacognition matter?
Research has identified student metacognition as a significant mechanism for producing positive learning outcomes (Millis, 2016; Wang et al., 1990). As Ambrose et al. assert (2010), self-directed learners can evaluate their knowledge and skill in the context of a learning task, prescribe a path to accomplish it, and monitor and adjust as needed along the way.

Indeed, undergraduate courses more traditionally focus on disciplinary content exclusively, instead of incorporating the practice of metacognitive skills into culture, instruction, or activities. Still, scholars find that embedding these pedagogical skills within instructional practice that connects disciplinary learning to metacognitive practice produces more proficient content-area learning (Metgzer et al., 2018; Kuiper & Pesut, 2004).

How to integrate student metacognition into practice
Metacognition, both language and habit, can become normative discourse in the classroom (Tanner, 2012; Pintrich 2002). Talking both *about* the strategies and *when* to apply them can demonstrate the value you place on these processes. When instructors give students permission to "be confused" and create a classroom culture where students can seek this missing clarity, student comfort level and willingness to trust the learning process increases (Tanner, 2012). Perhaps most importantly, students need not only *hear* instructors' explanations of the strategies, but they must *observe* them in practice, by either instructor or other students (Nilson, 2013). Metacognitive modeling by the instructor relies on their own self-reflective thinking. Instructors can explicitly show students how they (as experts) think procedurally (Tanner, 2012), whether it be solving a problem, engaging in reading of text, or organizing and studying for an exam. These concrete examples illuminate for students not only *what* is important to think about, but also *how* those with more experience do so. Finally, once students have observed, as with any new learning, they need opportunities to practice the metacognition and to receive meaningful feedback (Millis, 2016).

Next, embedding questions within regularly graded course material can help students see both the value and impact of "thinking about their thinking." Adapted from Tanner (2012), the series of tables below, organized along two dimensions, include sample questions that promote student metacognition. First, questions within each table correspond to the timing of the question: Before Implementation, During Implementation, or After Implementation.

Second, the tables include:
- questions that can be asked regarding individual Class Sessions (table 1),
- Active Learning Tasks or Homework (table 2),
- Quizzes or Exams (table 3),
- Overall Course (table 4).

Table 1: *Class Sessions*

Before	During	After
What are the goals of the class session going to be? What do you already know about this topic? How could you best prepare for the class session? Where should you sit and what should you be doing (or not doing) to best support my learning during class? What questions do you already have about this topic that you want to find out more about?	What insights am you having as you experience this class session? What confusions? What questions are arising for me during the class session? Are you writing them down somewhere? Do you find this interesting? Why or why not? How could you make this material personally relevant? Can you distinguish important information from details? If not, how will you figure this out?	What was today's class session about? What did you hear today that is in conflict with my prior understanding? How did the ideas of today's class session relate to previous class sessions? What did you find most interesting about class today?

Table 2: *Active-learning task and/or Homework*

Before	During	After
What is the instructor's goal in having me do this task? What are all the things you need to do to successfully accomplish this task? What resources do you need to complete the task? How will you make sure you have them? How much time do you need to complete the task? If you have done something like this before, how could you do a better job this time?	What strategies am you using that are working well or not working well to help me learn? What other resources could you be using to complete this task? What action should you take to get these? What is most challenging for me about this task? Most confusing? What could you do differently mid-assignment to address these challenges and confusions?	To what extent did you successfully accomplish the goals of the task? To what extent did you use resources available to me? If you were the instructor, what would you identify as strengths of my work and flaws in my work? When you do an assignment or task like this again, what do you want to remember to do differently? What worked well for me that you should use next time?

Table 3: *Quiz or Exam*

Before	During	After
What strategies will you use to study (e.g., study groups, problem sets, evaluating text figures, challenging myself with practice quizzes, and/or going to office hours and review sessions)? How much time do you plan on studying? Over what period of time and for how long each time you sit down do you need to study?	To what extent am I being systematic in my studying of all the material for the exam? To what extent am I taking advantage of all the learning supports available to me? Are you struggling with my motivation to study? If so, do you remember why you am taking this course?	What about my exam preparation worked well that you should remember to do next time? What did not work so well that you should not do next time or that you should change? What questions did you not answer correctly? Why? How did my answer compare with the suggested correct answer?

	Which of my confusions have you clarified? How were you able to get them clarified? Which confusions remain and how am you going to get them clarified?	What questions did you not answer correctly? Why? What confusions do you have that you still need to clarify?
Which aspects of the course material should you spend more or less time on, based on my current understanding?		

Table 4: *Overall Course*

Before	During	After
Why is it important to learn the material in this course? How does success in this course relate to my career goals? How am you going to actively monitor my learning in this course? What do you most want to learn in this course? What do you want to be able to do by the end of this course?	In what ways is the teaching in this course supportive of my learning? How could you maximize this? In what ways is the teaching in this course not supportive of my learning? How could you compensate for or change this? How interested am in in this course? How confident am you in my learning? What could you do to increase my interest and confidence?	What will you still remember 5 years from now that you learned in this course? What advice would you give a friend about how to learn the most in this course? If you were to teach this course, how would you change it? What have you learned about how you learn in this course that you could use in my future courses? In my career?

Beyond the questioning to promote metacognition, another effective way to incorporate is to implement activities and/or assignments explicitly geared toward metacognition. Part 3 of this series describes many concrete examples, ranging from those which can be accomplished in minutes to more comprehensive and sustained routines.

Citation
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