

*Features**Approaches to Biology Teaching and Learning***Promoting Student Metacognition**

Table 1.

Sample self-questions to promote student metacognition about learning<sup>a</sup>

Activity	Planning	Monitoring	Evaluating
Class session	<ul style="list-style-type: none"> <li>• What are the goals of the class session going to be?</li> <li>• What do I already know about this topic?</li> <li>• How could I best prepare for the class session?</li> <li>• Where should I sit and what should I be doing (or not doing) to best support my learning during class?</li> <li>• What questions do I already have about this topic that I want to find out more about?</li> </ul>	<ul style="list-style-type: none"> <li>• What insights am I having as I experience this class session? What confusions?</li> <li>• What questions are arising for me during the class session? Am I writing them down somewhere?</li> <li>• Do I find this interesting? Why or why not? How could I make this material personally relevant?</li> <li>• Can I distinguish important information from details? If not, how will I figure this out?</li> </ul>	<ul style="list-style-type: none"> <li>• What was today's class session about?</li> <li>• What did I hear today that is in conflict with my prior understanding?</li> <li>• How did the ideas of today's class session relate to previous class sessions?</li> <li>• What do I need to actively go and do now to get my questions answered and my confusions clarified?</li> <li>• What did I find most interesting about class today?</li> </ul>
Active-learning task and/or homework assignment	<ul style="list-style-type: none"> <li>• What is the instructor's goal in having me do this task?</li> <li>• What are all the things I need to do to successfully accomplish this task?</li> <li>• What resources do I need to complete the task? How will I make sure I have them?</li> <li>• How much time do I need to complete the task?</li> <li>• If I have done something like this before, how could I do a better job this time?</li> </ul>	<ul style="list-style-type: none"> <li>• What strategies am I using that are working well or not working well to help me learn?</li> <li>• What other resources could I be using to complete this task? What action should I take to get these?</li> <li>• What is most challenging for me about this task? Most confusing?</li> <li>• What could I do differently midassignment to address these challenges and confusions?</li> </ul>	<ul style="list-style-type: none"> <li>• To what extent did I successfully accomplish the goals of the task?</li> <li>• To what extent did I use resources available to me?</li> <li>• If I were the instructor, what would I identify as strengths of my work and flaws in my work?</li> <li>• When I do an assignment or task like this again, what do I want to remember to do differently? What worked well for me that I should use next time?</li> </ul>
Quiz or exam	<ul style="list-style-type: none"> <li>• What strategies will I use to study (e.g., study groups, problem sets, evaluating text</li> </ul>	<ul style="list-style-type: none"> <li>• To what extent am I being systematic in my studying of all the</li> </ul>	<ul style="list-style-type: none"> <li>• What about my exam preparation worked well that I should remember to do next time?</li> <li>• What did not</li> </ul>

Activity	Planning	Monitoring	Evaluating
	figures, challenging myself with practice quizzes, and/or going to office hours and review sessions)? • How much time do I plan on studying? Over what period of time and for how long each time I sit down do I need to study? • Which aspects of the course material should I spend more or less time on, based on my current understanding?	material for the exam? • To what extent am I taking advantage of all the learning supports available to me? • Am I struggling with my motivation to study? If so, do I remember why I am taking this course? • Which of my confusions have I clarified? How was I able to get them clarified? • Which confusions remain and how am I going to get them clarified?	work so well that I should not do next time or that I should change? • What questions did I not answer correctly? Why? How did my answer compare with the suggested correct answer? • What questions did I not answer correctly? Why? What confusions do I have that I still need to clarify?
Overall course	• Why is it important to learn the material in this course? • How does success in this course relate to my career goals? • How am I going to actively monitor my learning in this course? • What do I most want to learn in this course? • What do I 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 I maximize this? • In what ways is the teaching in this course not supportive of my learning? How could I compensate for or change this? • How interested am I in this course? How confident am I in my learning? What could I do to increase my interest and confidence?	• What will I still remember 5 yr from now that I learned in this course? • What advice would I give a friend about how to learn the most in this course? • If I were to teach this course, how would I change it? • What have I learned about how I learn in this course that I could use in my future biology/science courses? In my career?

<sup>4</sup>Inspired by Ertmer and Newby (1996), Schraw (1998), and Coutinho (2007).