

**Appendix A. CLASS-Bio Statements.** Expert consensus is denoted by A (agree) or D (disagree). Compared to the CLASS-Phys, statements denoted by (I) are identical (with “biology” replacing “physics”), statements denoted by (M) are modified from original CLASS-Phys statements, and statements denoted by (N) are new to the CLASS-Bio.

1. My curiosity about the living world led me to study biology. (A,N)
2. I think about the biology I experience in everyday life. (A,I)
3. After I study a topic in biology and feel that I understand it, I have difficulty applying that information to answer questions on the same topic. (D,M)
4. Knowledge in biology consists of many disconnected topics. (D,I)
5. When I am answering a biology question, I find it difficult to put what I know into my own words. (D,N)
6. I do not expect the rules of biological principles to help my understanding of the ideas. (D,M)
7. To understand biology, I sometimes think about my personal experiences and relate them to the topic being analyzed. (A,I)
8. If I get stuck on answering a biology question on my first try, I usually try to figure out a different way that works. (A,I)
9. I want to study biology because I want to make a contribution to society. (A,N)
10. If I don't remember a particular approach needed for a question on an exam, there's nothing much I can do (legally!) to come up with it. (D,M)

11. If I want to apply a method or idea used for understanding one biological problem to another problem, the problems must involve very similar situations. (D, M)
12. I enjoy figuring out answers to biology questions. (A, M)
13. It is important for the government to approve new scientific ideas before they can be widely accepted. (D, I)
14. Learning biology changes my ideas about how the natural world works. (A, M)
15. To learn biology, I only need to memorize facts and definitions. (D, M)
16. Reasoning skills used to understand biology can be helpful to my everyday life. (A, I)
17. It is a valuable use of my time to study the fundamental experiments behind biological ideas. (A, N)
18. If I had plenty of time, I would take a biology class outside of my major requirements just for fun. (A, N)
19. The subject of biology has little relation to what I experience in the real world. (D, I)
20. There are times I think about or solve a biology question in more than one way to help my understanding. (A, M)
21. If I get stuck on a biology question, there is no chance I'll figure it out on my own. (D, I)
22. When studying biology, I relate the important information to what I already know rather than just memorizing it the way it is presented. (A, I)
23. There is usually only one correct approach to solving a biology problem. (D, I)
24. When I am not pressed for time, I will continue to work on a biology problem until I understand why something works the way it does. (A, M)

25. Learning biology that is not directly relevant to or applicable to human health is not worth my time. (D, N)

26. Mathematical skills are important for understanding biology. (A, N)

27. I enjoy explaining biological ideas that I learn about to my friends. (A, N)

28. We use this statement to discard the survey of people who are not reading the questions. Please select agree (not strongly agree) for this question to preserve your answers.

29. The general public misunderstands many biological ideas. (A, N)

30. I do not spend more than a few minutes stuck on a biology question before giving up or seeking help from someone else. (D, M)

31. Biological principles are just to be memorized. (D, N)

32. For me, biology is primarily about learning known facts as opposed to investigating the unknown. (D, N)

**Appendix B. Explanations of how CLASS-Bio statements were modified following student interviews.**

Seven statements were revised as the result of interviews to clarify terminology or context of the question. As most of these were dropped following factor analysis, we will only describe the three that remain on the final version of the survey.

The statement “I do not spend more than five minutes stuck on a biology question before giving up or seeking help from someone else” created several concerns over “five minutes” and thus “five minutes” was replaced with “a few minutes.”

The statement “I will continue to work on a biology problem until I understand why something works the way it does” elicited ambiguous responses depending on whether students thought the context was an exam or a homework problem or how much time was available until homework was due. To clear up this issue of context, the phrase “When I am not pressed for time” was added to the beginning of the statement.

The statement “Spending a lot of time understanding the fundamental experiments behind biological concepts is a waste of time.” Again discrepancies about the amount of time led to the revision of the statement to “It is a valuable use of my time to study the fundamental experiments behind biological ideas”.