## Supplemental Digital Appendix 3

**Example Quotes From Student Responses to the Mid-course Questionnaire[a]**

| LEVEL 1 CATEGORIES | EXAMPLE QUOTES |
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| **Systematic thinking** | *"Talking through the concepts aloud makes sure that I don't miss any of the intermediary steps and my classmates can highlight things that I missed and vice versa."* |
| | *" I'm a very visual learner, and I've taken advantage of the personal whiteboards in the learning classroom to draw out concept map/graphs/equations during our mini-case sessions. I think that this has contributed to the learning of my fellow students as we've all come together to tackle our problems utilizing the visual aids."* |
| | *"I've learned best by breaking the cases down into smaller parts and thinking about it in the form of a concept map."* |
| | *"I believe that having a firmer grasp on the links between individual concepts presented in a concept map will benefit both myself and others in my groups; they represent systematic ways both to think and to explain to others."* |
| | *"I have learned best being pushed to articulate pathways and concept maps in small group settings to explain step-by-step why certain phenomenon have been happening."* |
| | *"I like to draw things out in a concept map; take complicated, real-world cases and then break them down in a digestible way and relate them to the essential principles we've studied."* |
| | *"I've found that taking a real step-wise approach to each situation is necessary to avoid faulty assumptions."* |
| | *"I find that it is often easy to skip steps in mechanisms or make assumptions about connections between physiologic variables, without entirely understanding the connections. Therefore, I would like to continue using concept maps to ensure that my step-by-step mechanisms worked out, without making leaps of logic."* |
| | *"These [concept maps] are concretizations of full diagnostic thought processes, which attempt to take into account all conditions learned and fully explore all potential situations in which symptoms or signs in question might arise."* |
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| **Focusing on unclear concepts** | *"The most effective learning method I've utilized in Homeostasis I is concept mapping. I've always been a kinesthetic learner, so taking the time to physically draw a map is incredibly helpful. Not only does it allow me to visualize and organize difficult concepts, it allows me to identify my gaps in understanding. I realized that if I cannot comfortably draw an arrow from one point to another, I need to review the material again."* |
| | *"X and Y do a great job identifying parts of my reasoning that are misconceptions and present their clarifying views, as do I for them."* |
| | *"It's helpful to get a back and forth discussion about these topics to see what misunderstandings we may have about a particular concept."* |

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| | *"Whenever my table doesn't agree on a question, it [concept map] gives us a chance to step back and reassess our understanding of the material. There have been a number of misunderstandings that we've corrected by taking the time to go over details of the relevant physiology with each other."* |
| | *"Drawing concept maps in my small group have been a very effective way of thinking about problems and finding misconceptions."* |
| | *"It [concept mapping] has been really helpful in allowing me to cement my conceptual understanding by teaching my peers and also allows me to catch misunderstandings or missed points."* |
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| **Balancing the discussion between students** | *"If I were able to reach a conclusion after working through the confusing concept, I will share my thought process and sometimes this helped to clarify something for others in my group. If I have not reached a convincing conclusion, the discussion is always helpful."* |
| | *"Concept mapping has helped me to better describe my own understanding of topics in that if the person I am trying to explain it to still does not understand, I need to think of new ways to get to the point."* |
| | *"Since different members of the group bring different prior knowledge and/or understanding of key concepts to the table, there is usually someone who can explain the topic in question succinctly and clearly."* |
| | "*I feel very comfortable sharing my thought process and ideas with the students at my table—really the whole process of discussing and bouncing ideas off of one another. I've tried to encourage quieter people at my table to share their thoughts first, or share part of my thought process, ask people what they think, and if they agree, ask them to share how they would proceed from there"* |
| | *"We've all come together to tackle our problems utilizing concept maps. Perhaps I can do this in an even better way by really waiting for everyone to develop their own ideas before diving into the group problem solving. Maybe the strategy could be to encourage everyone at the table to use their personal whiteboards so that we can more easily compare notes."* |
| | *"In our mini-case society-based sessions I feel that I have a good rapport with my group members and I feel that we all contribute equally to our table discussions."* |
| | *"I feel as though our dynamics have been positive and thoughtful, and I find that I am able to help clarify certain concepts that others may be struggling with, and vice versa."* |
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[a]From a study comparing a group of medical and dental students who were exposed to and used mechanistic concept maps (MCMs) as the primary learning tool to explain the concepts of a required first-year course (Homeostasis I) with groups of students in the same course who were not exposed to MCMs, Harvard Medical School, February-March 2016.