

Learning Bottlenecks: Chapter 1

Dolly Mullin, Communication

The TC I have been focusing on in research methods is that communication researchers attempt to identify and explain patterns among variables. More specifically, a critical concept is that there is a difference between a mere association (two variables go together) and a causal connection (one variable actually affects/influences another). The learning bottleneck is that many students do not see the difference.

The reason I know that this is a bottleneck is because students frequently ask for a list of “verbs” to memorize that will tell them that a causal relationship is being expressed. They get distressed even further once we get into discussing the kinds of research designs and data that cannot establish causal relationships because there are so many alternative explanations for the data.

In thinking about expert/novice practices, I am wondering if I am missing a step somewhere. So many unwarranted (and unchallenged) connections between things are being made every day in the news and social media that I think they do not see alternative explanations. I draw attention to this in specific examples in class, which I think helps a lot, but I think I need to draw their attention more to the idea that data always have different interpretations. On the other hand, I also have students who end up thinking that you can never conclude anything from anything—that all alternative explanations are always a possibility, when that is not the case either!

Nicole Alea Albada, Psychological and Brain Science

One of the major assignments in my research methods course is for students to write a research proposal (focusing on experimentation) in psychology. The biggest struggle that the students have, and thus what I see as the bottleneck, is linking the theoretical orientation for the proposed project with the hypotheses that they develop for their research proposal. The students have no problem defining the concepts of theory and hypothesis, but applying the constructs to a research proposal and seeing the links between them is a struggle. The bottleneck is occurring someplace in this process though I have not completely identified where. I think the problem is that students either do not understand that psychology is a theory-driven field because most of the students come to their research project idea first (e.g., I am interested in X in psychology) and then have to backtrack for a supporting theory.

I have developed various assignments working the students towards their research proposal in the course, and thus attempt to scaffold them through this process of linking theory with hypotheses. However, I am not completely satisfied with the structure and outcome of the assignments, as every quarter, students continue to have the same difficulty.

Stefanie Tcharos, Music

A typical bottleneck I see in majors encountering music as a historical and cultural study is their struggle to create a solid and clear, but compelling argument. I know it's a bottleneck when students

nervously show me drafts or ask for help and they are not sure how to articulate what "news" they bring to their essay. There are always some students who grasp this easily, but quite a few avoid articulating their argument directly (as if it should be implicit somehow), or their approach lacks original thought by merely restating things from materials for the course rather than truly developing an argument. In this quarter I hope to have some breakthroughs by designing my course's section writing activities so that they build to a larger writing assignment (for a grade). The first section introduced disciplinary ways of thinking and practicing by focusing on the course's threshold concept (*Music is not just a thing, but a set of practices filled with action. These actions reveal critical relationships between individuals, communities, and the social world*) through one of their first readings. They used that reading to explore what *is* an argument, and why it was effective. They practiced representational knowledge in the second section by identifying writerly tone, approach, and writing conventions in further readings. The aim was to get them to apply these practiced skills and their deepened understanding of the threshold concept in their own writing for their first assignment. I'm eager to see if this graded approach paid off in their papers!

Jeff Moehlis, Mechanical Engineering

A bottleneck in computer programming is learning to "think computationally", that is, learning how to turn a written problem statement into a computer program which solves the problem. Students who are having trouble with this bottleneck often say that they don't know how to get started writing a computer program to solve a given problem. They may have seen the teacher do a similar problem as an example in lecture, but they aren't able to see how that example can be adapted to a new problem. I believe that this reflects that the students don't really understand the examples. They can "smile and nod" while watching someone else write a program, thinking that they understand it, but when they sit down to do it themselves, they don't know what to do, or even how to begin.

In the past I have tried to address this bottleneck by encouraging students to do as many practice problems as they can. It's not enough to just look through the solutions and think, "Oh yeah, I could've come up with that." I encourage them to cover up the solutions and try writing the necessary programs. If they get stuck, I tell them to peek a little at the solution, but just enough to get going again. I warn them that this will involve some struggle, but it's much better to struggle on the practice problems and figure out what they need to do rather than struggling on the exams. Overall, I try to instill that learning to program is an "active" activity, not a "passive" activity. You have to train your brain to write programs, by practicing writing a bunch of programs.