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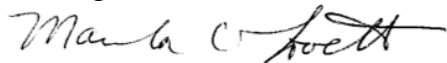
September 25, 2011

Dear Po,

Thanks for inviting me to sit in on your "Putnam competition" course. As you know, I have had a chance to visit all three sections. This memo provides you with a summary of what I observed and highlights some of the teaching strategies you used that I see as promoting students' learning. In other words, the bulk of my summary puts a label on some of the strategies that I would encourage you to maintain and even increase, where possible, in your teaching. Because it seemed as if the course – across the three sections – was proceeding smoothly, I only included a few additional suggestions, mostly logistical, at the end.

At this point, if you are interested in getting a sense of students' perception of how the course is going, one productive option is to administer an informal "early course evaluation". I highly recommend the advice and resources on the Eberly website at the URL: www.cmu.edu/teaching/designteach/teach/early-course-evaluations.html. On this page, there is an Early Course Evaluation Form that is very useful in getting students' constructive feedback. Please feel free to contact me if you have questions about or would like help with that process, or if you have any other teaching-related topics you would like to discuss.

Best regards,



Marsha C. Lovett
Senior Associate Director, Eberly Center for Teaching Excellence
Associate Teaching Professor, Department of Psychology

Summary of class observations and advice

Sharing your enthusiasm: In all three sections, you demonstrated such enthusiasm for your discipline and your course that it was contagious. This is clearly central to your teaching style, and it is sure to contribute to students' learning -- e.g., when they too see the joy in problem solving, they will engage in it more and hence learn more. Moreover, your energy likely helps students in sections A and B stay more attentive and thus follow the solutions you are writing on the board more closely. Needless to say, I encourage you to continue this aspect of your teaching. (And I'm sure you will do so without even trying!)

Highlighting general problem-solving strategies: Several times when you were talking through solution steps, you made comments that pointed to problem-solving techniques or strategies that went beyond the current problem and that could help students improve their problem solving in general. For example, you highlighted the value of "representing" the problem, labeling

quantities of interest, trying small cases, and working backwards. It is helpful to mention these strategies explicitly and really draw students' attention to them, because students often think about solution steps as applying specifically to a given problem. The more you can highlight these strategies when they arise and emphasize their general nature, the more students will develop their problem-solving skills.

Helping students learn when to use these problem-solving strategies. Oftentimes students know about a strategy and even know how to apply it, but they still have difficulty solving problems because they do not know *when* they should apply the strategy. For example, when you talked about applying the pigeonhole principle in one class, you mentioned what “tipped you off” that this idea might be useful: namely, that the problem had $k+1$ vectors, each of dimension k . You then reiterated that having k and $k+1$ of something was an important condition for considering use of the pigeonhole principle. This is exactly the kind of “when” information that students need to learn. So, be sure to include this information when you are teaching. For example, for some of your weekly topics, it would be great if you could articulate when that topic tends to be appropriate/useful in problem solving (e.g., when you discuss proof by contradiction, explain to students how one can tell when it tends to be good to try a proof-by-contradiction approach). I realize that some of this strategizing may be so automatic for you that it's hard to articulate, but trying to explain why and when you choose particular strategies can be very helpful for your students.

Creating a “safe” and welcoming atmosphere. One tricky aspect of teaching sections B and C in this course is that you largely rely on students' input for solving the problems. In section B, this means that you have to respond publicly to students' ideas and suggestions in a way that is supportive and yet corrects their revealed misconceptions and errors, as necessary. In section C, this means that you have to respond to students' work (more privately) but in a way that encourages them to keep trying as independently as they can. In both sections, I noticed that you knew and used students' names quite often. Doing so is terrific because it automatically puts students more at ease. In section B, when soliciting students' next steps, you made it safe for students to propose an idea by asking “Who has an idea?” and reassuring them that “You don't need to have the solution.” These simple ways of phrasing the question reduce the pressure. You also promoted broad participation by asking if you could “Hear from someone else?” These are all excellent strategies for making students feel encouraged to participate. And when students asked a question or made a suggestion, you responded in a way that recognized their contribution because it either helped move the solution forward or gave you better insight into how students might think of the problem.

A few additional suggestions and considerations

- In section C, let students know that they can call you over when they are stuck or have a question. When I visited, you were rather busy talking to students whom you seemed to identify. I wondered if other students might think you were too busy to be called over. If some students believe this, they would benefit from hearing you say that you would prefer to know when and where you are needed.
- Also in section C, I noticed that you spent more time with some students than others. This could be completely appropriate given students' varying needs, but I did want to make

sure that you pay attention to which students you are visiting more vs. less and why. It is always difficult to be “fair” in giving attention to all the students in one’s class. In this section of your course, “fair” may mean giving help adequately according to students’ individual needs.

- Finally with respect to section C, it may be worthwhile asking students to separate their chairs a bit more (especially between the rows) or to spread out in the room, so that you can more easily move around and monitor their work.
- In section A, it is hard for students to hear other students when they speak up and contribute to your “lecture”. So, it is a good idea to repeat the students’ comment/step/question (even if you do so in your own words).