0.1 Asking the right questions

When my teaching is evaluated by my students, they often say that I never answer questions, or answer them with another question. I take it as a complement even though it isn't meant as one. The most common such interchanges are

> Student: Is this right?
> Instructor: I don't know. Does it sound right to you? Can you elaborate?
>
> Student: What should we do from here?
> Instructor: What do you think? Does anyone have any ideas?
>
> Student: Can we say blah blah blah?
> Instructor: I don't know, can you?

There is a certain amount of this you can get away with, depending on your personality and theirs. If you start sounding like "Eliza"[1], you won't get good results. Instead, try to ask them useful questions related to the specifics of what they've said. In the three above scenarios, try respectively

> Are you asking if your computation is correct, or if it will prove useful?
>
> Is there a problem-soving strategy that you know that might work here? Why don't these equations tell you what x is?
>
> If you're wondering whether you can assign the variable z to be the average of all the prices, the answer is yes, but you haven't yet said whether we know anything about z.

[1] The computer program imitating a nondirctional therapist, an early (and crude) approximation to something that could past the Turing test.

When observing other classes, this is where you should let your imagination run free. Imagine what questions they might have asked. You hindsight now will be your foresight tomorrow.

The question "do you understand?" is the most often abused. (Notice that this virtually the only question in the repertoire of the conventional lecturer and rarely elicits an honest response.) Some better variants are: can you say that in your own words? could you do what John just said with different numbers? do you agree or disagree? in what way is this similar to what so and so did? These are all listening-comprehension questions, which will tell you whether a students has taken in the meaning of what was said more reliably than if you ask the student to report a Yes/No answer.

Good questioning can help to reach flaming dead ends. Ask what happens when $x = 5$, or whether their purported method works for all starting data and not just what was given. If a student gives a vague definition, find a borderline case and ask how their definition applies in that case. Try also questions that goad by disingenuity. If their method is more general than they realize, pretend they got lucky (ham it up!). Ask how they got lucky enough to try their method on a square rather than a pentagon or hexagon for which it "probably wouldn't have worked"; summarize for them that "because n was a multiple of 10, you were able to find k and l to fit the information given."

A final point to emphasize is: **don't make your questions too easy**. Often instructors who are having trouble getting students to speak up will tone down their questions, and are then puzzled that the chilly atmosphere doesn't improve. A timid student sees a too-easy question as a no-win situation. Either the student gets it right, which is not really impressive, or gets it wrong which is doubly embarrassing. It's better to make the reward higher. Long-term confidence is built by the realization that you can answer something nontrivial. And don't forget there may be students who are being quiet because they're bored; they will certainly appreciate your finding an alternative to going slower.

There are ways to construct nonthreatening questions that are suitable for tempting the timid out of their shell. Ask them to guess something that they don't have much of a basis

for guessing yet, and get half a dozen different answers on the board to emphasize that it's still guesswork at this point. Ask others to agree or disagree with any of the guesses and discuss their relative merits. Ask them to help you read each other's mind: "Ah, 16 is an intelligent guess - can you see why Jackie thinks the answer might be 16?"