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Teaching Bits: "Random Thoughts on Teaching"

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"It’s Amazing What You Don’t Have to Tell Them"

Most of us are finished with the academic year; we can sit back and relax a bit during this short summer and reflect on our past year of teaching before madly preparing for the next one. One question I always ask myself at the end of each year is, "What did I learn from my students this year?" Here are some of the thoughts that came to mind.

I was reminded that every student is different, and that they are all trying to do the best they can with what they’ve got, including their financial, employment, academic, and family situations (not just what grades they got in their math prerequisite courses.) In a class of 450 students, it’s often hard to think individually when everything you do is for the masses, but I always have a handful of students each quarter that remind me of the complexity of their lives, the commitment they are making in taking my class, and how much they appreciate my efforts to make their big class seem small.

I realized how techno-savvy students are these days. This reflects my age I am sure, but it’s no longer an issue for students to figure out how to make histograms on their own in Minitab, Excel, etc. I don’t need to worry about how-to manuals anymore. Just putting a few brief instructions online or running through one quick example sends them on their way. I also made podcasts of my lectures and before I knew it I had 200 students downloading them and listening to me talk while they worked out in the gym. (I’m still not sure how I feel about that.)

This year I really went out on a limb – I learned how to use our course management system (blackboard, Desire2learn, etc) to its maximum capacity. Before, all I did with the course management system was enter grades and post a few things. This year, I added a groups feature which allows you to form and change groups of students on the system. Through this feature the students in each group can work together online, save their work in a folder, and submit assignments from their group. Then as a teacher, I can go in, pull up their assignment, make comments, save, and put it back in their folder for their eyes only. Then when I enter a grade for their group, it’s automatically entered into the system for each student in the group. Through this process you can work with your students as they modify an assignment/report/project quickly and effectively. I learned these tricks from my teaching assistant this year, but there are many free workshops that you can take to learn how to use a system like this – I recommend it!

All of these new revelations were great, but by far the most important thing I learned, or should I say confirmed, is the ability of the students. It truly is amazing what you don’t have to teach them. As long as you set them up properly in a scenario/situation, and they have good resources available, they will run with it. In fact, they run faster and further with it than I ever could.

Now I’m not talking entirely about ‘100% discovery based learning’; this might be a little too far out for some. We don’t need the students discovering the formula for margin of error on their own (although my theory is that they could

figure it out once they understand standard error and the empirical rule—but that's for another day.) But once you've talked a little bit about summary statistics and graphs for example, they certainly could be left with a data set to explore in their own way and tell a story about. Then you could lead a more detailed discussion about standard deviation and mean vs. median when they've got results to look at and care about.

Now we all know that yes, students can read instructions, and yes, they should be able to figure things out for themselves; but we can still get frustrated. After giving/providing directions on how to make a histogram in class, you can still get those little questions like "I tried to make a table like you said but it isn't working for this problem;" or "How do you make a histogram again? I don't remember what you said"; or "Oh yeah I tried to read the directions but they were too confusing". How to curb this problem? Easy. When it comes to logistical issues of how to do something, don't give them the answers. Point them to the good resources you've made accessible, and stand your ground when they ask you questions. Tell them they are in charge, that you 'just work here', and you know they can figure it out. That's what I do all the time. At first they won't like it and will try to push you – stay strong. If you need to give them a little something before you walk away, you can – as long as it's just a hint. You can always come back to check on them later. And when you do, 99% of the time, they will have figured it out and are working on their next question for you.

Once that path to learning is made clear through good resources, clear directions, and a bit of background information, wonderful things can happen! Here's an example from a class I had this past year. One day I brought in a set of catapults that launch balls/gummy bears using different settings (many teachers have used them; they are affectionately known as 'statapults'.) Instead of the traditional approach with the usual designed experiment to see which combination of settings yielded the furthest gummy bear launch, I tried something new. I brought in the catapults and said "Here's a cool gizmo that our company bought the rights to. We think it could be a rival to the corn hole game. It's your job to take this contraption and figure out a way we can market it as a family game. You need to: 1) come up with a good name for the game; 2) write down clear and simple instructions; 3) establish a points system to determine a winner; and 4) justify your points system using statistics.

In addition to the statapults, I brought in a box of things from my office that I thought they might want to use with their game, including dice, marbles, rulers, measuring tapes, an empty can; a bowl; and some targets I printed off. As soon as I gave them their directions, they dove in. They grabbed materials, jumped on the floor, and started playing. Some students worked at the computer, some did the launching, and some were discussing which strategy to try next. Interestingly, the first thing they all chose to do was figure out which settings yielded the furthest launches, so they could assign points appropriately. (In other words, they naturally constructed a designed experiment to get information they needed.) As an added bonus, you might agree with my surprise when many of them incorporated probability into their game – one group used dice to determine which settings each person got to use for each round (with the settings yielding the shortest distances and the fewest points getting the highest probabilities.)

The students all wanted me to try out their games (one even gave extra points for hitting a moving teacher.) And in less than 70 minutes I had 9 groups of students turning in wonderful game proposals. Each game met all of the criteria for being a big success. The use of probability and statistics was impressive, but for me, the most rewarding part was watching them take the challenge and immediately jump into it. Once they understood the instructions and they had enough statistical knowledge to accomplish their task, they didn't need me, and they didn't need a detailed assignment to come up with something great that they (and I) will always remember.

How do you go about getting something like this to work? It's not nearly as hard as you think. Setting the expectations for students to learn on their own is critical. Set the tone on day one that their resources are: 1) the computer, including all instructions, tables, programs, etc that you've provided; 2) their group members (if applicable) and 3) the instructor-but only in a pinch. Your job is to make sure your instructions to them are clear, the expectations are outlined, and the resources are there. From there, turn them loose and keep them in charge of their own learning. Don't step in to intervene; walk around asking them questions, give hints, and give them positive feedback. But don't show them how to do something, or they'll use you as a crutch forever. It's hard to let go of the traditional role of the teacher telling the students, even when you are doing a group activity, but it's much more rewarding to see what they've got to tell you! (To check whether you are getting overly involved, see if you ask to borrow their pencil or to use their keyboard to show them what to do. If so, stop yourself - or keep your hands behind your back!)

The key to letting your students go is in your planning. First decide what you want them to learn or apply, and work backwards from there. Once you set the learning objective (for example, students will design an experiment to answer a question) you must determine what statistical ideas or concepts are required for background knowledge and be sure they are covered or reviewed. Then ask yourself, "What parts of this process can they figure out themselves?" (For example, it's natural for students to think about controlling for confounding variables or repeating the trials.) For those items, create a simple scenario (like my catapult game) and let them go. (When in doubt, let them figure it out!) It might be a little scary, but what's the worst thing that will happen? The activity doesn't work, so you make it a homework assignment and call it a day. What's the best thing that could happen? They have fun figuring things out on their own; they feel the freedom and confidence of their own abilities and those of their group members; they are reassured that you are there as a backup in case they absolutely need you; and whatever they learn that day they will learn for a lifetime.

So as we all try to catch our breath this summer, I encourage you to reflect on your past year. Think of all the successes you had, and what you learned from your students. And as you plan for next year, think about letting your students go a couple of times. It's amazing what you won't have to tell them - and that says a lot about you!

Those are my random thoughts on teaching for this time around. Now what do YOU think?
