

The Insight

The author's MATH 220 courses were dramatically transformed for the better in response to careful assessment.

Implications

The changes made led to myriad benefits in student performance and classroom atmosphere.

"Do something. If it works, do more of it. If it doesn't, do something else."

-- Franklin D. Roosevelt

"Closing the loop" Part III: a case-study on the impacts of careful assessment

This is the third and final Learning InSights article in a series on "closing the loop", i.e. making changes to a course based on assessment data. In the first article, I listed several questions one might want to ask upon teaching a course, and in Part II, I described various places where someone could look for data that helps answer those questions. Part II also mentioned how an examination of these questions in the aftermath of a MATH 220 (Calculus 1) course I taught at Ferris in Fall 2012 helped me zero in on specific problems with the course.

In response to the problems I outlined in Part II, I implemented several changes to MATH 220 the next time I taught it:

1. I introduced new pedagogy, and with it, a new assessment mechanism. I changed my MATH 220 course from a purely lecture-based class to a "3+1" model, where students spend 3 hours per week in a traditional classroom setting and 1 hour per week working in a computer lab on student-centered, technology-based assignments.
2. I changed the materials I used in the course. To ameliorate the problems I observed with students' note-taking, I wrote extensive lecture notes for MATH 220 which contain the key concepts of the course and examples used in class; students can download these notes or purchase them as a course pack. To make sure students attend, the notes are only partially "filled in"; solutions to example problems are not provided and questions I want the class to think about or discuss in lecture are left unanswered.
3. I changed the sequence in which I presented material on optimization, beginning with an activity emphasizing the differences between the two classes of optimization problems students had trouble distinguishing (addressing the common student error discussed in last week's article).

After making these (and other) changes, here's what happened:

1. Student learning dramatically improved: in Fall 2012, only 68% of my MATH 220 students finished with a course average of 60% or better; in Fall 2013 (the next time I taught 220), more than 90% finished with a course average of 60% or better. Over the same time period, the percentage of students finishing with a course average of 90% or better went from 12% to 34%. This improved performance has persisted in my calculus classes through the present, and I have found similar improvement on each individual MATH 220 exam as well as in course averages.
2. My marks on student evaluations improved: in Fall 2012, my adjusted course average on IDEA surveys was 3.6/5. In Fall 2013, this averaged to 4.3/5 (and these scores have continued to climb: my most recent average for MATH 220 is 4.7/5). Qualitative comments are much more positive than they were in Fall 2012, as well.
3. I've observed other benefits, some of which I didn't expect: I've been able to cover more material than I used to; students who complete my course can use their proficiency with the computer algebra system in more advanced courses; the classroom atmosphere is more relaxed; several students who have taken 220 from me have switched programs into one offered by the math department; I've developed relationships with past calculus students who are now pursuing undergraduate research under my direction.

The punch line is simple: based on my experience, assessment works! And following the advice of FDR in the quote attached with this article, I have continued doing it, looking critically at each of my classes after I teach them, analyzing the impact of changes I've made and looking for specific refinements that might further improve students' learning. While not all of my ideas are effective, it's clear that on balance, "closing the loop" in response to assessment has improved my courses in measurable ways.

¹To see these notes, go to <http://mcclendonmath.com/220.html> and click on "Lecture Notes".