

The Use of Graded Journals in Freshman Mathematics Classes

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One of the first things that I notice when I start to teach an introductory mathematics class for non-majors is the ability of my students to communicate what they are doing. Or their lack thereof.

Often my students are expressive in other disciplines, such as history or political science. Yet when it comes to using the written word in a mathematics class, well, they seem to check their English at the door.

It's not as if I've set a very good example myself. I'm a speed demon when I lecture; it's hard for me to slow myself down to use complete sentences on the blackboard. I want to show them the *good* stuff.

Yet, mathematics is more than just pushing symbols around until they look good. *Mathematics is fundamentally about reasoning and communicating that reasoning in a fashion that permits other people to affirm or deny it.*

I often add minor writing requirements to my assignments, requiring answers to be given in full sentences, etc. This is good and important in terms of finished product, but it doesn't really deal with the underlying anxiety.

I think that many of my students write so little in my class for fear of getting it wrong. Many of them carry a lot of math anxiety with them into the classroom, and will go to great lengths (including failing my class) to avoid looking stupid. One of the things about writing mathematics: it becomes clear pretty quickly whether or not you understand what you are talking about.

I find that my students' writing improves if I give them a writing assignment not focussed on a single problem. In most of my service classes I have been requiring journals of one form or another for the past few years. I have not broken any new ground, particularly. I just find them to be helpful and think that you might find them to be helpful also.

For me a journal entry is something that should be completed for each class. If the class can be quickly summarized, e.g., the day of the exam, then I don't expect more than a couple of sentences. On the other hand, if we've had a regular class then the students should be able to write at least half a page about that class.

Half a page of what? I leave that up to the students, as long as it refers to the class itself. It can be a summary of the material, questions that didn't get asked in class, questions as to the significance of the material, etc.

Let me show you some examples from my Business Calculus class this term:

1. I learned about instantaneous rates of change and how we can know the speed, time, or temperature at any given moment. Rate of change is an average. For instance, if we drove 100 miles in 2 hours, we would be driving an average of 50 MPH. The continuous compound interest problems tell us that this usually gets the best results, but the interest rate is generally lower than that of annual or daily compounding. Leibniz and Newton fought for who would determine the simplest (sic) formula for rate of change. Slopes from X/Y give us tangent or secant lines that may give averages or specifics, depending on the set of data. If we want instantaneous rate of change, at one point on a curve, we draw a tangent line that touches the curve at that point, and find its slope. I did not understand that on the last homework, but now it is easier as I do more examples.

This student was having trouble separating some topics (rates of change, continuous compound interest), but basically seems okay.

2. To tell you the truth, which is probably what you want, today was one of those days where I was in a daze. Not because of the work, but because it was just one of those days. Once I get a chance to re-do homework #5, I will know better if I understand what we did in the first part of class. The second part of class was devoted to average and instantaneous rates of change. Everything seemed relatively reasonable. Rise over run was a basic concept. Finally, we went over the point about where the tangent line falls if the curve is concave up, concave down, or has an inflection points.

I am boring this student—(s)he has seen the material before. If I get enough responses of this flavor, I need to pick up the pace.

Sometimes the journal entries from a given class show a complete lack of understanding of my beautifully constructed presentation. Without the direct feedback from the students (prior to course evaluation forms at the end of the term, or even homework and quiz grades) I would be ready to move speedily on without realizing my failure to communicate.

I encourage the students to take the opportunity to use the journal entries as a way to practice writing mathematics. My grade (minor in value per journal, cumulatively significant) is entirely as to length and whether it is about the class for the given day. I do answer questions and make corrections, but I never take points off as I do so.

The time involvement is rather minimal, and I feel that what I and my students get out of the process is significant.