

## What Were They Thinking?

Hugh walked slowly back to his office, puzzled by his class's reaction to the midterm. Since he had been careful to cover all the material and in plenty of time for students to review, he thought that they would find it pretty straightforward. However, from their faces and comments as they handed the exams in it sounded like either he, or they, had misjudged:

*Man, that was hard. How'd you expect us to do that?*

*That was nothing—I mean nothing—like the homework.*

*I studied so hard, but it didn't help in the slightest on those problems. Next time, I may as well wing it for all the help studying gave me.*

Hugh had planned to grade the exams that Friday afternoon, before digging in for the weekend to get ready for his first presentation at his new advisor's seminar. But now he was not looking forward to looking at the exams.

Hugh was in his second year of graduate school. He had found the first year of graduate school hard, but not impossible. Sometimes he felt as though he was surrounded by people who knew what they wanted to work on and whom they wanted to work with. He was envious of the foreign students who had done so much more than he before they entered graduate school. But, he had reminded himself, he would have an easier time adjusting to teaching in an American classroom than they.

Over the summer, Hugh read a great deal and eventually gathered enough courage to make an appointment to ask Professor Zwecki to be his advisor. Igor Zwecki, who was internationally known, had recently moved to Chestnut Valley University as the university had been willing to accommodate his many graduate students. Professor Zwecki looked surprised to see Hugh, but agreed to take him on if Hugh could keep up with the weekly seminar that he insisted all his grad students attend. Hugh, not feeling as confident as he sounded, said that he was sure he could.

Although his own course work had sometimes been grueling, Hugh had found teaching last year to be relatively easy. As a recitation instructor in a large lecture section of Calculus I he had enjoyed explaining the points that he felt the professor had skipped over, and he had found that the students were happy provided that he went over all of their homework questions. They didn't come to office hours much, but that didn't surprise him, as he had not gone to office hours himself as an undergraduate—it was almost a matter of pride that he should figure out the answers to his own questions. He had several students transfer to his section, saying that they had found him much easier to understand than the other TAs. The professor had a few meetings with the TAs, but largely for administrative purposes, so Hugh's assessment

of his own teaching was based on the end-of-the-semester evaluations. These were not strong for the course as a whole:

*It would help if the professor would explain how to do the problems before they are due, not after.*

*Book sucks. It is only useful for someone who has had the course before.*

*How about giving us enough time to do the exams?*

However, the comments on Hugh's performance as a TA were encouraging:

*Brightman was the best TA.*

*Mostly clear, and could do all of the homework problems.*

*I wouldn't have got through the course if it wasn't for the notes that I got in Brightman's sections.*

Hugh had expected to be selected to be one of the TAs who taught their own course under faculty supervision as early as second year. He had misgivings about doing this since he knew that he needed to concentrate on getting his own work moving. When he was offered the chance to teach his own course he had talked it over with Paul, his officemate. Paul had said that it wasn't necessarily too much work if Hugh were to arrange to teach in a course where the supervisor did not hold too many meetings. Paul told Hugh whom to request and said that he could certainly borrow Paul's old exams and lecture notes. Of course, Paul had pointed out, the course might be a bit different now, since the department had switched books. But he didn't think that would really make much difference. Grateful for the advice, Hugh had requested, and got, a section of Calculus II under Professor Gatewood. Mike Gatewood was an experienced and popular teacher who had got the process of running a large course down to a fine art. Efficiency was particularly on his mind at the moment as he was in the running for the open deanship. So far the term was exactly as Hugh had hoped—few course meetings and no major problems.

Well before the first exam Hugh went through Paul's old exams and chose several of the more interesting problems from them. He added a few of his own and then showed it to Paul, who suggested that the last one might be too hard. Hugh cut it down a bit but pointed out to Paul that he had done one just like it in class. It was a problem on exponential decay in which the half-life was given; the question was to calculate the fraction remaining after two half-lives. Hugh had asked for the fraction remaining after  $n$  half-lives too, but omitted that after talking to Paul. He went by Professor Gatewood's office several times, hoping to show him the exam. The only time the office door was not shut he saw Gatewood in the middle of what looked like a long phone call, and so decided to leave the exam in Gatewood's

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mailbox. Later that day the exam was returned with two typos marked but no other comments.

Hugh's students were half freshmen, fresh from high school calculus, and half upperclassmen. In class they were quiet and seemed bored. Hugh knew that for many of them integration was review, and several times apologized for going over material that most people knew. But, he said, he was required to go over it again as not everyone had had it. He tried to ask questions but no one seemed inclined to answer, so he decided not to push it. As with the office hours, Hugh remembered how he had felt as an undergraduate, when he often preferred just to hear the lecture uninterrupted by questions and diversions.

Hugh decided to make the material more interesting by explaining the underpinnings—a bit on existence and uniqueness as he started differential equations, and he was planning on including something on Fourier series to liven up the section on series. The homework problems he graded were, in general, fine. He was surprised when so few students came to ask questions before the exam, but convinced himself that they really were finding the course too easy.

So nothing led Hugh to expect the directness and near venom that he felt when students were handing in the exam. He decided to go to the library and see how bad they really were. As soon as he started to grade his heart sank. He couldn't believe that they couldn't integrate  $x^2 \cos x$  and that several papers thought that the integral of  $1/x^2$  was  $\ln x^2$ . How could they possibly think this, Hugh thought—I spent so much time making sure they saw the definition of the natural log as the integral of  $1/x$ .

With deepening concern, Hugh turned to the exponential decay problem. It was a disaster. How could they possibly not have realized that half-life means half the stuff decays, and so in two half-lives one quarter remains? But instead of the two-line answer Hugh had expected, he was faced with pages and pages of messy calculations involving logarithms (often manipulated by rules he had never seen before) and trailing off into messy answers to six decimal places. What *were* they thinking?