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### **Why I Teach Introductory Courses**

Most people can think back and find a teacher who inspired them to think new thoughts, who found a way to make learning rewarding, or who provided encouragement that proved to be formative in later years. For many of us, the image is that of a seasoned professor who had seen students come and go, and somehow found particular merit in our own questions and interests. It seems that this inspirational role would be found often in the introductory classes, because that is where students form their ideas about what they want to do, and why.

Introductory classes in big schools tend to be big classes (my

Biology 101 has 700 students), and this creates misconceptions about the importance of teaching introductory classes, or even of teaching at all in big schools. One misunderstanding is that you have to go to a little school (that has smaller classes) to find someone who is interested in students. Of course, there is no guarantee that professors at small colleges are especially good at what they do, and those at big universities usually got there by a passionate dedication to their scholarly field. Class size by itself does not indicate directly what experience a student will have, but whether or not a class is an introductory class does indicate a great deal about the

challenges the professor must meet, and what rewards both professor and student will get from the experience.

Introductory "101" classes are commonly taught by the faculty newcomers, or those who have stepped out of research, or professors in their twilight. This is understandable from a practical view. Most professors have obligations split over many levels because the administration wants professors who teach graduate students through formal classes or personal mentoring, teach their colleagues through publication of prominent research, and plot the future for students of tomorrow by serving as leaders in professional societies, editors of journals, organizers of symposia, and so forth. This is a lot to expect simultaneously of anyone, and the people who do these things are usually not listed to teach 101 under the idea that they are awfully busy, and anyone else ought to be able to teach 101. But, I think it is important that the professors in the mainstream teach 101, also. Several independent arguments support this view, and I will take three in turn. One is general well being, an idea that I think ought to be enough to

validate this perspective by itself. Second, I will point out special problems that experienced professors can deal with well, but others might find to be a struggle. Last, I will address personal self interest, which should not be sold short even if it seems somewhat, well, *selfish*. I beg forgiveness that I use biological examples throughout, but that is the area I know best, and I am sure readers will enjoy substituting pertinent examples or exceptions chosen from their own fields.

#### **General well being.**

It is obvious that tomorrow's voters and the leaders they choose have to come from someplace, and it is important that they come from our classrooms, and are able to judge issues of concern to us. If you doubt the value of training the electorate, think of some time when you have been stuck in a line at a grocery or retail store and overheard a conversation of startling ignorance. The creativity of ignorance is hard to imitate. One of my favorites was, "I wanted to visit her in the hospital, but I didn't want to risk catching breast cancer myself." I tell this story for a laugh sometimes, but there is nothing funny about it,

certainly not the ignorant world view promoted by my neighbor in the line, the assertion that you can catch cancer by visiting someone in the hospital. She meant well, but could not be prevented from doing the wrong thing by her naive understanding of the causes of breast cancer. Any educated person has had a similar event at one time or another on issues of personal concern. Remember that these people vote, and if you are in the business of education, then their ignorance is certainly your business. For a national case, consider O.J. Simpson. Personally, I do not care much about this case or its outcome, but society at large seems to have decided that this was an important case. It is remarkable, then, that a jury had to be trained on the spot to understand what DNA is, how it varies, and what it means to find a kind of "match." It seems that a little more introductory biology is necessary in society at large, for if we can't trust juries to make good decisions, then what of democracy itself? Professors who do not hold basic education in high esteem have no cause to complain when things go wrong due to poor general education. Here, in Ohio, it is plain that the average taxpayer

and legislator is not interested much in supporting education. We need to make sure the taxpayers we see are happy with what they bought, and that they understand the need to use their knowledge.

Of course, the general well being of society at large is more than anyone can lay claim to, but certainly we must have an idea of the well being of our academic community. If we are so cloistered in our academic environment that the concept of training next year's electorate is not enough, what of training the next faculty? I assume my colleagues in other departments and colleges have some say as to what we do in Biology, and I certainly hope that they have some understanding of biology. Some of my 101 students will go on to be leaders in political science, or English, or psychology, and so forth, and I hope that when they are faculty at other universities and colleges, they are sympathetic to my biological colleagues there. I am certain I have educated as many budding graduate students of other fields through my Bio 101 as I have graduate students of biology in my other courses. That investment comes back to me if I want to see my field grow elsewhere. Perhaps

the students I teach in Bio 101 are not going to reward me in any way directly, but for the general well being of biology as a whole I should teach them all with affection and vigor.

I don't know which of my Bio 101 students are destined for great things, but I know that most of the graduate students in my department are. It is easy for me to say that I would be better off spending an hour discussing esoteric research with a graduate student than lecturing to a hall full of anonymous people, but is it true? If I really wanted to influence biology favorably, I would grab a rich industrialist and convince him to give lots of money to my favorite causes. Think of Andrew Carnegie, who was poorly educated but grew rich in industry and gave generously to philanthropy, including establishing in Pittsburgh one of the world's great institutions of art and science. Where do the next generation's Carnegies come

from? Some of them are in Bio 101 right now, and if I can make them like and remember biology favorably, perhaps in their golden years they will show favor to my community. This idea is not as far fetched as it seems. Before I came to Ohio State in 1994, I was a research postdoctoral associate at the American Museum of Natural History in New York, and some of my research was paid for by a philanthropist who, as a middle-class boy, walked the halls of the Museum on rainy days. Now wealthy, he gives away money to the young researchers who work in the Museum because he likes the idea of it. Artists are long familiar with

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the philanthropist angle, but really it is just an extension of the idea that people outside our field should appreciate what we sell. Introductory courses are full of people outside our field. How can we afford to overlook that?

Finally, there is the humanitarian approach. I wonder, sometimes, who

makes the greater contribution to biology, the professors who study medical estoterica with their few graduate students, or the professors who train a thousand students a year and release them into the world. Even if it is related to cancer prevention, a research program of gene regulation in mice is not likely to help anyone next year. By contrast, the idea that a single professor could substantially improve the lives of hundreds of people in a few months would make any physician envious. Certainly, on an hour-by-hour basis, teaching a large introductory class has benefits that are hard to beat. Of course, life is not all about staying alive, and one fundamental goal of education is to make life worth living. Appreciating art history is a way that people appreciate life itself. Learning a foreign language, a musical skill, or understanding historical roots of today's politics and cultures all provide a reason to enjoy life. Students who never see us again lead richer lives, lives worth living, just because they learned from us how to appreciate the world around them. Because this is the fundamental point behind a liberal arts education, it seems it should be reason enough to teach basic courses.

**Special problems** (that experienced professors can deal with well).

One reason that experienced professors should teach the introductory courses, especially the nonmajors sections, is that experience provides solutions to problems that are a necessary part of the design. As mentioned above, these courses tend to be large, creating unique difficulty. First, the professor has to establish by dress, behavior, and organization, the image of being completely in charge. The professor has to command the students' attention, and any joking familiarity is done on the professor's terms. It is important to establish some discipline in a large class, and students who perform casual disregard of lecture (reading the newspaper, chatting with neighbors) must be stopped or the other students are cheated of their investment. Confidence means everything to creating authority, and more mature professors have practice promoting this image even if it does not come naturally to them.

At the same time as large classes require a kind of authority figure, they also require that there is some effort to reduce the distance between the professor and the

students. Students will perform better if they think the professor is a real person rather than an anonymous robot at a podium. A professor who walks in the aisles, or who shows up early and waits in the hall with the students, or who pops in on the small sections of the course seems to earn some kind of affection nearly for free because students think that they have special proximity to a kind of celebrity. Students relish light and cheerful contact with professors of big courses, they tell their roommates and classmates about them, and they somehow form the idea that they enjoyed a close encounter with someone famous. Of course, the students only value the decrease in distance if they see that something of the separation remains to make their personal contact rare or special. Established professors are often better able to play with students and yet remain in character; they are better practiced at being themselves informally and being the professor at the same time. They are better able to use to advantage the curious duality of life on campus: the students don't age, only the professors do. The faces I see every year look about the same, but I keep getting older, and older,

and older. Yet when I collapse that distance even temporarily, the students are amused and pleased, and it is more poignant, because I am clearly much older than they are.

Recognizing a professor as an authority figure may make students more attentive, but it has an undesirable effect of blurring the distinction between things that an entire community supports and what this lecturer alone thinks. One of the most important struggles that students of introductory courses have is to learn to balance the role of the "professor as oracle" versus the "professor as advocate." This is played out in part because some things are both beyond doubt and beyond explanation in the introductory class, and the professor needs to say, "Just follow me on this one, you have to accept it, if you keep studying you will eventually come to understand." This is the professor as oracle. But how do students tell when this is the case versus when the professor is promoting one of several views in a debate that is unresolved, the professor as advocate? This difficulty regarding the professor's behavior is made worse by the sometimes superficial approach of

the students themselves. Some students want simply to hear the truth, the best answer, or what will be on the test, and this approach holds the professor as some flawless source of knowledge, even if a certain statement is equivocal, not definitive, or even rejected by other discussion in class. For these students, memorization seems the key to success, despite the fact that one of the principle goals of introductory courses is to teach students how to think about certain issues. Of equal problematic significance (but in opposite direction) to the memorizers who want the professor to be an oracle, some students think that all opinions and all positions are equally valid, and feel they should be given recognition for making a stance with sincerity regardless of the assumptions or consequences of that stance. These students see that the professor is merely an advocate, even when an entire community of scholars is united in agreement. For these students, finding an angle that

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includes a few consistent points is enough, regardless of how that relates to universally accepted principles or facts. They often seem to take their intellectual development as some sort of game in which their job is to out-smart the

professor. Of course, they mostly lose themselves in a maze of their own making. The contrast between these two poles, the oracle versus the advocate, illustrates that it is important that students learn the difference between things that are beyond debate and things that are unknown or unknowable. This is an area in which more senior scholars generally do better at keeping the new students in the game even as they correct their missteps. Because this is an important life lesson, and only the complexion of the problems changes from field to field, this struggle should be taken as one of the primary difficulties that we overcome in teaching introductory students.

Introductory students often approach class material with

inappropriate goals or intentions, and because so many students take the introductory classes, it is clear that many are destined to fail. It is not the professor's duty to see that they all pass, but it is part of his or her responsibility to see that students of merit are given a chance to succeed despite difficulties they suffer outside the demands of the course syllabus. This is a very difficult area in which people who struggle are given grace for poor performance, but somehow there must be an accounting of whether or not they are worthy. For example, it is easy to see that students vary in whether they have enough money to go to school as their primary responsibility, or if they have to work a job (including caring for a family). Also, students vary according to whether they are intelligent enough that the class work is easy, or they have to work hard to achieve the goals of the class. Given these two variables, we can see that students who are "wealthy and bright" will succeed without particular accommodation, while those that are either "wealthy, not bright" or "not wealthy, but bright" will have to work harder to succeed. The last category "not wealthy, not bright" also appears in

introductory classes, and their performance in the classes outside their major may determine if they can proceed with their education or not. They may need some accommodation, and here is where a more experienced teacher knows how to show some flexibility that makes sense. Of course, wealthy and bright students can also fail the first midterm and seem to be deserving of a little consideration. Indeed, the B+ student hustling for an A can be just as much in need (for his own goals) as the marginal D student is, and so who deserves grace, and why, quickly becomes complicated. The trouble is that if you are going to give struggling students a chance to succeed, you also have to see some struggling students fail despite your grants of special favor. I think more experienced teachers see better when enough is enough, and can explain better to those students why they should seek another avenue of self improvement. This is one of the hardest things to do, and so it should be done by people who have the patience and compassion that life experience gives us.

#### **Personal self interest**

I think that after the first

time, it is pretty easy to teach an introductory course. It is easy to preach to the novice, it is easy to tell with enthusiasm stories that are well-known to everyone in the field, but not this audience. The material doesn't change much. Often it is possible to pull articles from newspapers and current events that are useful for class to make the lesson seem pertinent to the students' lives. The students in an introductory class do not expect much, and most think they will not like the course, so they appreciate it if the course is only "not bad". We all want students to enjoy our classes, but I am also pleased when non-majors say, "I hated biology in high school, but this class was not that bad." Teaching 101 is a kind of missionary work at times, and such a response is *exactly* what we hope for in a general sense. Because indifference on the part of the students is taken as success on the part of the professors; it seems that it can't be very hard to achieve our goals.

If introductory classes have modest goals because of the diversity of students, then they make up for it by unexpected opportunity for free thinking. Often, students who are not already

indoctrinated to my field have observations that are novel and challenging in unexpected ways. Students bring life, modern views, and questions to me that I cannot produce myself. When I look at a class of hundreds of students, I know that the sum of their world experience is larger than mine. They are also more recently trained in the fields I do not tend carefully, and the sum of their imagination is much greater than anything I could hope to achieve. In general, I think I fare rather well anticipating their questions and views, but it is impossible to generate the same fountain of creativity that they produce. It keeps me on my toes. As a minimum, I always know why I think what I think, and occasionally I will have cause to reexamine and doubt something because an introductory student asked an iconoclastic question that was particularly insightful. Indeed, those of us who teach can keep up with our friends who have elite positions as full time researchers partly because we have so many students to fuel our own imagination. There is no substitute for this. For example, when I was studying thermodynamics in introductory physics in 1977, my

professor (a Nobel Laureate) explained how the rate of heat production and heat loss limits mammals to be no smaller than a shrew, and of course, shrews are the smallest mammals. A student in the front row asked "Dr. Purcell, what about baby shrews?" The professor's jaw dropped; he had never thought of that. It seems that if introductory students in physics can leach a Nobel Laureate something, then I want to be where introductory students are.

In closing, if we value teaching anywhere, then teaching

introductory classes must be regarded as deeply important to our agenda as a whole. We educate our future colleagues, our neighbors, and our leaders more than does teaching classes full of Department majors. We teach people how to make their life richer. By having experienced professors teach introductory courses, we bring into the classroom exactly those people who are most adept with the difficult duties that attend this high goal. Finally, teaching introductory classes can be easy, fun, and educational, even for the professor.