

PROFESSOR: So typically in the course we start off talking about the structure of these cellular materials. We do some modeling of honeycomb and foam type materials, and that takes not quite half the term, but most of the first part of the term anyway. And I give them more problem sets at the beginning of the term, and they don't really start on the projects at the beginning. So I give them some background information to get them going.

And I assign the project at the beginning of the course, and I think there's three kind of deadlines. One is they have to give me a proposal. I think that's typically about a month into the course, and that can be fairly brief, but I want to at least know they've got a team. They've got an idea. They've got some idea of how they're going to carry out their project.

Then in about another month they have to send me a sort of update on the project, and by that point, I would have expected them, if they're doing a literature review, to start reading some papers and be able to tell me something about the background to their project. If they're doing experiments, I would have expected them to at least gone into the lab and maybe made some materials, or bought some materials, and done some preliminary tests. And I give them feedback at that point. And at the end of the term, they hand in the final project.

And I see them twice a week in class, and I don't really have a formal recitation, but what I do do is every week that a problem set is due I have office hours. And in fact, I don't actually have it in my office. I book a room, and we do a little tutorial. So there's times throughout the term they can see me and come and ask me questions about the project as well.

So the question is what kind of feedback do I give the students and how do they interact with me on the projects, and typically there's about 20 students that take the course. So if they do it in pairs, there's roughly 10 projects. Some of the projects students just do literature searches, and I don't really get that involved with those.

They're perfectly capable of going to the library and doing a literature search.

And some of the students who are taking it are graduate students, and they often do finite element numerical calculations. And again, I give them some advice about how to set it up, but often they have experience doing this, and it's sort of applying what they already know to something new, but they kind of know what to do. The way I get the most involved is if students do experimental projects.

So for instance, in this elephant skull project, I had this connection at the Museum of Comparative Zoology, and I took the student up there. They had this idea about 3D printing it, and we have a 3D printer in the department. And one of the technical staff, Mike Tarkanian, is very, very good with the students and very helpful in getting them set up on the 3D printer, so he helps with that.

And I give them sort of general advice. When they said now we want to measure some sort of acoustical response, I suggested maybe you could suspend it from a wire, or thread, or something and then put an accelerometer and measure the vibrations. So I try to give them some general advice like that, but they then carry the experiment out themselves. They have to figure out how to actually put it into practice and how to do it.

And I think they get a big kick out of that. MIT students enjoy that kind of thing so that's kind of fun, and obviously I was very delighted too with this elephant skull project. So there's different things I try to help with-- mostly giving general advice about how they can do their experimental projects.

So what are some of the challenges that students encounter in their projects. So I think one thing is students sometimes are little over ambitious in what's possible to accomplish, because typically we have to cover some material before they can even start the project. So typically they don't start the project until a month or six weeks into the term, and the term is only three months long more or less. And so they really have a fairly limited amount of time-- maybe six weeks or eight weeks, something like that-- to actually do the project.

So if they want to make materials, if they want to do some sort of processing to make a foam, for example, they don't really have a lot of time, because often it takes some trial and error to be able to do that. So the projects have to be fairly focused so that they can actually get something interesting out of it in a fairly short amount of time. And sometimes students might want to do something where they would have to order materials, and it may take a few weeks for the materials to come in.

So again, I try to discourage them from doing projects where there's going to be a long lead time on getting some critical thing that they need for the project. So there are some limitations, partly because of just the time we have for them to actually do it. And they're not just taking my course. They're taking other courses, so there's sort of a limited amount of time they can spend on it, too.