Optimizing your teaching load

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Abstract

The teaching responsibilities of faculty members are worked out with their respective departments and/or colleges. Teaching loads are usually fixed, but individual faculty may have options on how to meet that load. They may choose more or fewer different courses, multiple sections of an individual course, a combination of undergraduate and graduate classes, or a combination of face-to-face and distance-education classes. On the assumption that new faculty can learn from the experience of others, a survey was administered to faculty from across the country, primarily in engineering programs. The results offer guidance on what combinations of courses to request to maximize one's effectiveness.

Keywords: teaching load, multi-section courses, piggybacked courses, distance education

1. Introduction

If asked whether it is easier to teach two sections of the same course, or one section of two different courses, most new instructors would opt for the single course. And, if asked whether it is easier to teach a small course or a large course, almost all would opt for the small course. But they would not always be right. This paper explores some of the reasons why.

The author of this paper draws from 30 years of teaching experience. To augment his observations, a web-based survey was developed using Google Forms, and sent to three listservs for college educators and educational researchers: the POD Mailing List, the ACM SIGCSE Members List, and the Engineering Technology[1] listserv.

The survey received 78 responses. Of course, this is not a representative sample, but the goal of the survey was not to determine with any level of certainty what most faculty preferred, only to identify issues that faculty should consider in making teaching requests. As such, it identified dozens of considerations that might bear on an instructor's choices.

[1] pod@listserv.nd.edu, the listserv of the Professional and Organizational Development (POD) Network in Higher Education; sigcse-members@acm.org, the listserv of the ACM's Special Interest Group on Computer Science Education; and etd-l@listproc.tamu.edu, the listserv of ASEE's Engineering Technology Division.

2. Multiple sections of one course vs. single sections of multiple courses

By a margin of 74 to 3 (Figure 1), respondents thought it was more work to teach a single section of multiple courses, rather than multiple sections of the same course. There were several reasons for this, which can be divided into three categories.

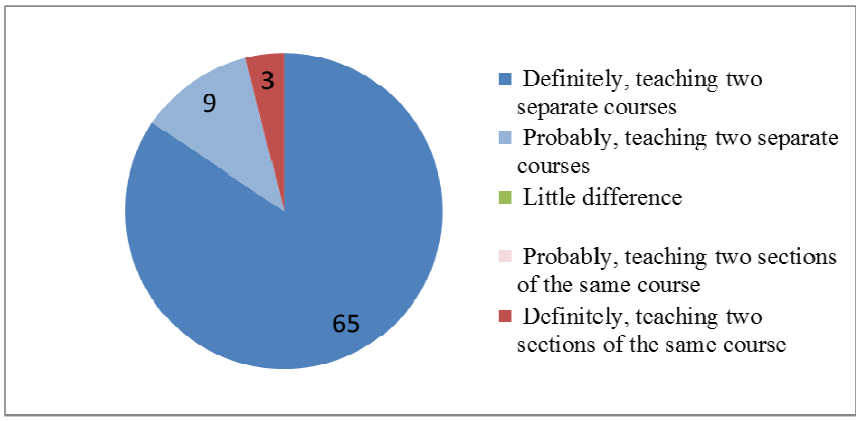

Figure 1. "Which is more work, teaching two separate courses, or teaching two sections of the same course?"

Advantages of teaching multiple sections of the same course

Category 1: Time savings

Reason #1: Fewer preparations. "Preparations" for teaching a class occupy the bulk of the time an instructor will spend on a course, especially the first time it is taught. Teaching multiple sections reduces this time in several ways. There is only one set of lectures to prepare for. This saves several hours per class the first term that one teaches a class, and significant time, perhaps 1–2 hours per class, for subsequent offerings.

Reason #2: Fewer homework assignments. In many situations, the time it takes to develop a homework assignment is independent of the number of classes or students it is used for. This includes the time to develop the specification, create a model solution, and develop a grading rubric. It also includes time for grading, because as one grades students' work, one learns what to look out for and develops "momentum," that makes it possible to grade later submissions more quickly. Conversely, when there are separate assignments for separate courses, one incurs startup overhead multiple times.

Even if homework is graded automatically, it is easier to set up a single assignment. Work of students in additional sections is essentially graded "for free."

Note that what has been said about homework assignments also applies to labs, but perhaps even more so, since labs tend to be more time consuming to set up than regular homework assignments.

Reason #3: Fewer exams. In giving exams, vigilance is always necessary to prevent students from finding out answers from those who took the exam earlier. But, if sections are taught back to back, the danger is minimized. If out-of-class common exams are scheduled, it is eliminated. Then a single exam can be used, which will save several hours in creating the exam, and save grading time as well, due to lower startup overhead.

Reason #4: Less web site/LMS overhead. Teaching one class means only one course web site, and only one course to set up in a learning management system. The same assignments, grade weights and policies apply to all sections.

Reason #5: Fewer meetings of course staff. In most courses, it's necessary to meet with TA(s) once a week, and this meeting may last an hour. In multi-section courses, a single meeting suffices.

Reason #6: Less work to "flip" or "hybridize" a class. There's been great interest in "flipped" or "inverted" classes in the last three years. Presentations of material can be recorded for students to view at their own pace. Then class time can be used for group inquiry exercises. The main up-front cost of this approach is recording the video presentations. But instructor videos can be used for multiple sections with no additional overhead.

Category 2: Reinforcement

Reason #1: Lower cognitive load. There is only one body of knowledge to be kept in mind over an entire term. This makes it easier to focus on issues of concern about the course. If you give a certain amount of "think time" to your teaching, focusing all of it on one course will help you teach more reflectively on that course.

Reason #2: The rehearsal effect. The first time one makes a presentation, mistakes are inevitable. Practice makes perfect, and reflecting on what you did in one section will help you do a better job in another section. One caveat: More practice is not always an advantage, as we will discuss in the next section.

Reason #3: Questions from students in one section may help in another section. Presenting the material multiple times lets you observe the reactions of different sets of students. A student in one class may ask a question that leads you to present the same material better to the other class.

Category 3: Advantages for educational research

As educators, we should be interested in improving how we teach. That is the subject of the SoTL (Science of Teaching and Learning) movement [1] that has established itself in the academy in recent years. Teaching multiple sections facilitates the "paired section" approach to SoTL research: Implement a particular educational innovation in one section of a course, but not in the other(s), and measure the difference in educational outcomes. This is a more direct way of observing the effect of the innovation than if one had to compare instructor A's section using the innovation with instructor B's section that does not use it. In the latter case, differences in student outcomes might be due to the instructors' style of teaching, experience, or any number of other factors. Thus, teaching multi-section courses enables certain kinds of SoTL research.

Advantages of teaching a single section of different courses

Reason #1: Diminishes routineness. Lectures in the second section of a class may come across as more rehearsed. Earlier, we cited this as a benefit, but it is not always so. The instructor may sound less spontaneous, or even bored. One of the instructors commented that in the first delivery of any lecture, he sounds "fresher."

Reason #2: Mitigates cognitive interference. When teaching multiple sections, it is easy to get confused about what was said or covered in one section vs. in the other. This makes it hard for the instructor to know whether all the steps for an explanation have been covered in a previous class session, for example, or whether material covered on an exam has in fact been covered in all the sections. This difficulty does not arise when teaching multiple courses.

Reason #3: Avoids synchronization problems. The pace or sequence of topics in a class may be influenced by the difficulties students have, or the questions they ask. Sometimes this prevents the instructor from covering all intended topics during a class section. But the same questions/difficulties may not arise in the other section, so the two sections get out of sync. This exacerbates scheduling difficulties, and worsens cognitive interference.

Reason #4: Allows grading load to be staggered. When teaching different courses with different assignments, the instructor can arrange it so that exams and major homework assignments occur in different weeks in different courses, which allows him/her to balance the amount of grading work in any particular week. When teaching multiple sections of the same course, the grading work bunches up, which means that, on average, the students must wait longer for their graded work to be returned. Since prompt feedback is an important factor in effective learning, learning outcomes may suffer. This problem can be mitigated, however, if ample TA support is available.

Reason #5: Facilitates shared responsibility. If you are teaching multiple sections of a class, you may be the only instructor teaching the course. Then you are responsible for all the homework, exams, and labs. To make matters worse, multiple-section courses tend to be introductory courses, where students need to be given more complete guidance on how to do the projects, and are less prepared to deal with ambiguity. Any mis-specification can lead to mass confusion. If problems arise, you cannot rely on a colleague to help fix them as you could if the colleague were teaching another section.

In summary, these guidelines can be gleaned from the responses.

- If the course you are teaching is new (to you), then multiple sections of the same course is definitely, overwhelmingly, less work than teaching two new courses.
- If the multiple sections you teach are back to back, then you can give the same exams to both classes, which makes multiple sections more time-efficient.
- If you teach many different courses during the same term (say, you are teaching at least four different classes/sections during a semester), then teaching multiple sections of the same course is a big win.
- If the course is a large multi-section course and you are in charge of all the sections, that's a lot more work, because you have no one to share the load with.

One respondent [2] noted that "flipped" courses [3, 4] change the equation in favor of teaching multiple sections. They remove the first three advantages of teaching only one section at a time (diminishing routineness, mitigating cognitive interference, and avoiding synchronization problems). This would make the advantages of teaching multiple sections even more formidable.

3. Multiple sections in a single semester vs. one section each semester

Often it's difficult to schedule the same instructor for multiple sections in a single semester. Teaching the same course more than once per year may require teaching it once each semester. Obviously, this needs to be a course that is *offered* each semester, so it may not be an option in small departments. But where it is, our respondents thought, by a margin of 57 to 11 (Figure 2), that it was easier to teach the multiple sections in a single semester. All of the category 1 ("time savings") reasons from the previous section apply. Additional considerations include—

Consideration #1: Course revisions. Every time you teach a course, you will probably want to revise it, to update the material or try out a new teaching strategy. These revisions take time. If you teach the course every semester, you revise it less frequently, and that means an overall time savings. However, if you teach the course every semester, the revisions tend to be smaller, and therefore less risky. Software, labs, and other issues

change less from one offering to the next. The fact that you are revisiting your strategies and revising more frequently can lead to a better course.

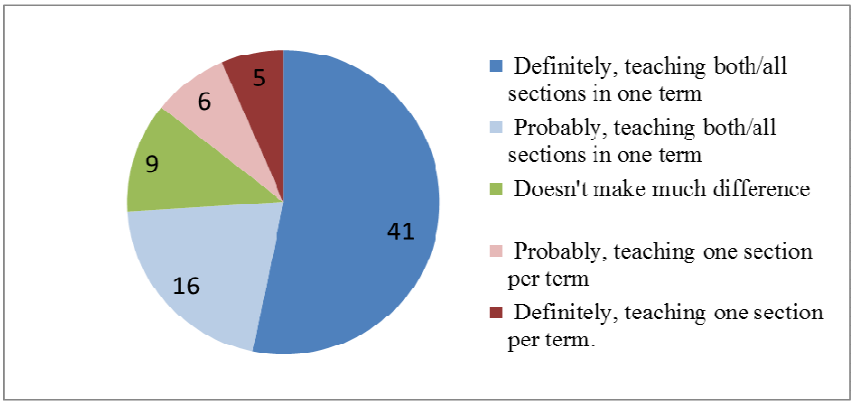

Figure 2. "If you teach the same course multiple times in a year, is it easier to teach both/all sections in the same term, or one section per term?"

Consideration #2: Familiarity. Skills that you practice regularly tend to become second nature, so you can do them almost without thinking. The longer you go without practicing them, the more effort that is required to re-familiarize yourself with them. This is why we want students to practice skills for homework before we cover them on an exam. It works the same for instructors. The more frequently you "practice" teaching a particular lesson, the easier it is to do well the next time. "Cramming" all of your practice into one or two days, as you would typically do when teaching multiple sections in a single semester, is less effective in helping you to do better the next time around.

Consideration #3: Freeing time for research. As an advantage of teaching multiple sections in a single semester, one of the survey respondents listed, "Frees up other semester for research." It is probably rare for a junior faculty member ever to be completely absolved from teaching in a particular semester. But if is a possibility in your case, it would be worth the scheduling effort it requires.

4. Small classes vs. large classes

Conventional wisdom holds that small classes are better than large classes. Our instructors certainly agreed, by a margin of 70 to 2 (Figure 3). (For the purposes of the survey, "small" was defined as less than 20–25 students, and "large" was defined as more than 40–50.) But some of them pointed out that they were comparing *one* small class to one large class. That's not the right comparison in many teaching-load formulas, which allow instructors who teach larger classes to teach fewer classes overall.

Advantages of small classes

Category 1: Individualized instruction. One instructor put it this way: "You can get to know the students better and treat them as individuals rather than commodities." You can more easily see if they are struggling, or bored. In general, it is easier to connect with the student.

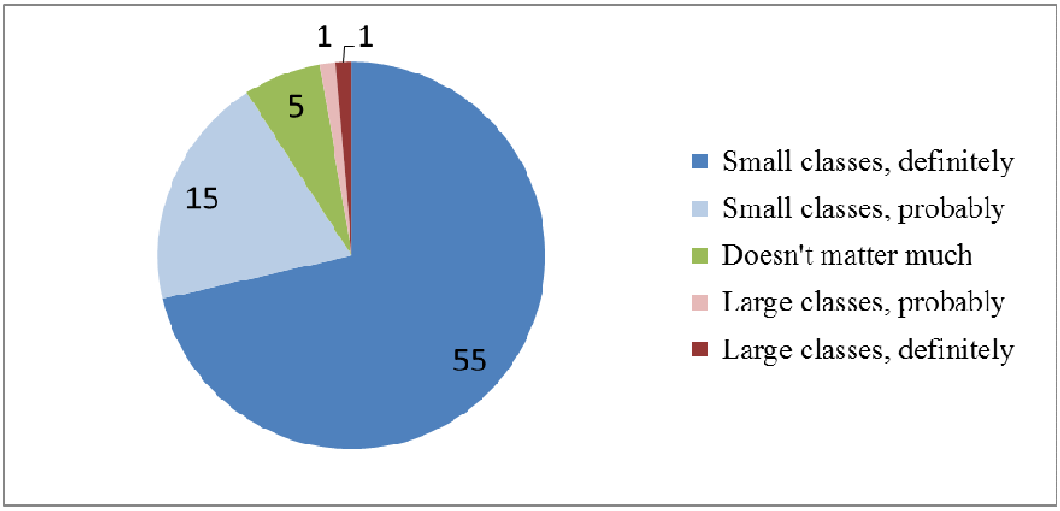

Figure 3. "Do you prefer to teach small classes or large classes?"

There is more of a chance to work one-on-one with a student outside of class, or give individual attention in a lab. Students feel less intimidated about asking questions in class. The instructor can adapt the lecture content more effectively in response to student concerns.

There's a better opportunity to give feedback to students. More formative feedback can be given on homework, and it can be given in a more timely manner, while the material is still fresh in the students' minds. It doesn't take days to get a homework assignment graded.

Category 2: Volume of work. Small classes are less work. There is less e-mail to answer. (In a large class, this can be partially offset by encouraging students to answer each other's questions on a message board like Piazza.) There's less traffic during office hours, and less chance of having to deal with a disruptive student.

Recordkeeping is much easier in a small class. In any class, there will be some special situations (e.g., excused absences) that should be dealt with individually. In a large class, it's difficult to handle special situations consistently and fairly. In a small class, there will be only one or two of them, so consistency problems are largely absent.

Category 3: In-class activities. Many kinds of active-learning activities are more feasible in a small class. It is easier to have students work problems "on the board." There is enough time for individual students or student groups to make presentations to the entire class. Class discussions can be held, with every member of the class having an opportunity to participate.

Several new pedagogies, such as Problem-Based Learning (PBL) [5] and Process-Oriented Guided-Inquiry Learning (POGIL) [6], rely on students working in groups to solve problems. This requires rearranging the seats so that students can face each other. Small classrooms tend to have movable seating, which facilitates group work. Large classrooms mostly have fixed seating, making it difficult to work in groups of more than two, and impossible to work in groups of more than three. Note that this is not an intrinsic advantage of small classes, since large classrooms (such as SCALE-UP [7] classrooms) can be outfitted with round tables. But alas, such classrooms are still rare.

Advantages of large classes

Category 1: Interaction among students. Classes that are too small (say, less than 10 students) make it difficult for students to do group projects—it may be hard to find students with compatible backgrounds, interests, or schedules. In lower-division courses, especially, it may be difficult to get adequate class participation. Class discussions may wind down too quickly. In a large class, it is easy for students to get help from other students in setting up a software environment on their computer. In a small class, the instructor may have to do it personally.

Clickers can be used to advantage in large classes. Students are asked to answer a question individually; then they discuss the answers and can be given an opportunity to change their answer. It takes time to plan good peer-instruction exercises, and it's easier to justify the time when many students will benefit from it. Students may be more understanding when asked to purchase a clicker for a large class rather than a small class. Tech support is needed to make clickers work smoothly, and it is more likely to be available if the class is large.

Category 2: Less effort per credit hour taught. In a large class, on most campuses, you *will* get TA or grader support; in a small class, you may not. If you have multiple TAs, they can specialize in performing different tasks. For example, in a recent class, the author assigned two TAs to write specifications for, and grade, programming assignments, while two other TAs were assigned to write up topics for, and assist in grading, writing assignments. Different TAs were assigned as liaisons to different kinds of term projects.

Add to that the fact that a teaching-load formula usually gives you more credit for teaching a large class. As one instructor put it, “Large classes are definitely better in terms of actual work per formula work.”

Conversely, “Another consideration is that small courses are often small for a reason: the students write term papers, or it’s a TA training course and you're supposed to watch them teach, or something similarly work-intensive that isn’t considered in the workload formula.”

Category 3: Student-generated content. Some instructors assign students to create artifacts that can later be used in teaching the course [8, 9]. For example, students may be asked to make up a homework or test question, or supplement a particular section of the textbook in a particular way. These exercises are useful pedagogically, because they require students to think about the material on a deeper level than they would in just solving problems or reading the textbook. They are also useful to the instructor, because some of them will be good enough to be used the next time the course is taught. This can help overcome to hurdle that students can get web access to almost any textbook solution manual.

Large classes provide more student-generated content, and hence, more useful student-generated content. Small classes will “use up” textbook problems much more quickly than they can generate new ones. By contrast, a class of about 100–150 students can be “self-sufficient” in homework problems, creating as many usable problems as they “consume” during a semester.

5. The case of “piggybacked” undergraduate/graduate courses

Some departments offer combined undergraduate/graduate courses, where two classes are taught in the same classroom: an undergraduate course and a related graduate course. Typically, the graduate students are required to complete more ambitious homework assignments or projects. These courses are known by different terms, such as “dual-listed” or “piggybacked.” They address two separate problems in scheduling: (i) both undergraduate and graduate courses are required in the curriculum, but there are not enough instructors to teach both; and (ii) there is not enough enrollment in one or both courses to justify offering them as separate courses.

The survey asked respondents whether it was easier to teach a piggybacked course than to teach separate undergrad and grad courses. Responses were mixed (Figure 4), with 28 saying piggybacked courses were easier, and 22 saying they weren’t. But those who were in favor of piggybacking had less to say about it than those who weren’t.

Reasons advanced for piggybacking being easier included—

Reason #1: "One and a half" courses instead of two. There is less "face time," which allows for more time grading, prepping, and performing administrative duties.

Reason #2: A synergy between assignments. "I just distinguish assignments. We take time in class for undergrad assignments and grad presentations. It's a nice mix."

Comments saying piggybacking is not easier fell into three categories:

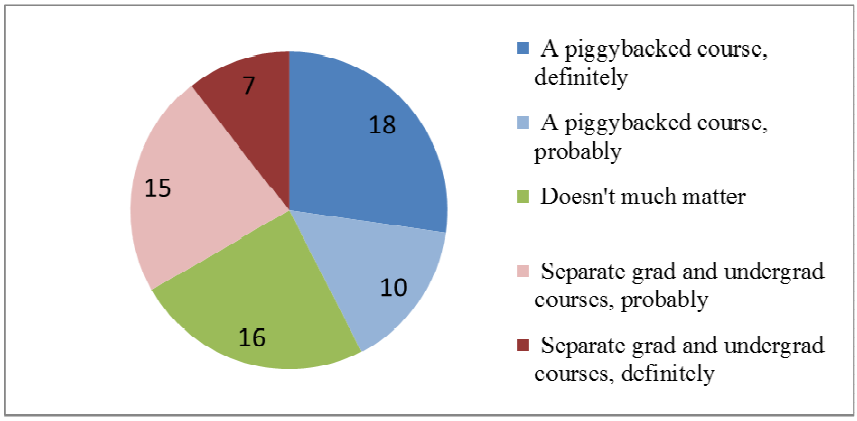

Figure 4. "Is it easier to teach one 'piggybacked' undergrad/grad course than to teach two separate courses?"

Category #1: Reasons why piggybacking is difficult in general. It is difficult to differentiate between the grad and undergrad courses. "You are sending a silent message to Graduate Students that the undergraduate course is 'good enough' for their needs in a graduate program and you are telling the undergraduate students that the course is suited for graduate-level credit, thus setting up false expectations for student success and quality of the various courses. Dedicated undergraduate and dedicated graduate courses are much more effective in my opinion. [10]"

The reasoning behind this is that graduate courses should be different: "A graduate course should be more than just a lecture. There should be a deeper discussion about the topic, as well as more personalized assignments that directly relate to graduate research, rather than just a regurgitation of the lecture."

Category #2: Reasons why piggybacking can't be effective in some courses. In some courses, the undergrad approach would be more practice oriented, and the grad approach would be more research oriented.

Category #3: Piggybacked courses are more work. This relates to the fact that teaching-load formulas don't scale up proportionally to the number of students. An instructor may get more credit for teaching a course of, say, more than 100 students, but the difference between 30 and 40 may not make any difference in the number of other courses (s)he is

required to teach. Hence, adding a handful of grad students to an undergrad course may not buy the instructor out of any other work, but requires different homework assignments and possibly different exams to be generated.

6. Combining face-to-face and distance-education courses

Another opportunity to teach two sections as if they were one is to combine the work for a face-to-face and distance-ed ("online") section of the same course. Of our respondents, 26 of them thought this would save time, and 13 didn't (Figure 5). The reasons in favor of it saving time mirror those for teaching multiple face-to-face sections. For example,

"I've done this dozens of times over a 40+ year career. Definitely easier because there is only one set of exams and assignments to prepare and you are focused on the topic. See comment above about two sections of the same course in the same semester. [11]"

Just as with multiple on-campus sections, questions from students in one section can help improve delivery to the other section. The same efficiencies occur in setting up course Web sites and LMS sections, and organizing course projects. With improvements in

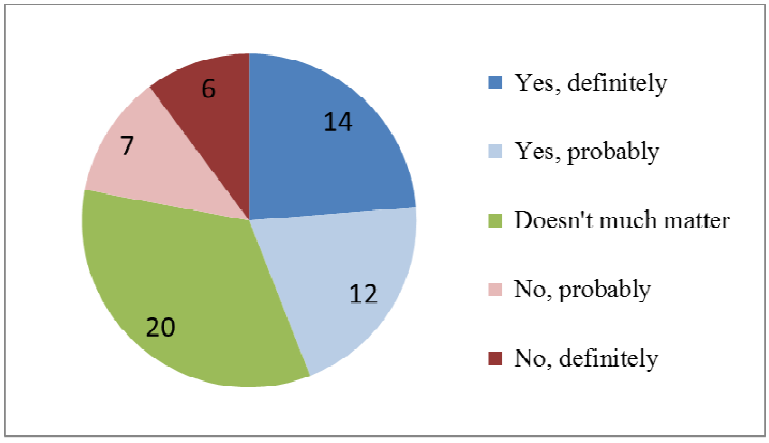

Figure 5. "If you are teaching a distance-ed course, does it save time to teach it during the same semester as you teach an on-campus section of the same course?"

technology for remote collaboration, it may even be possible to have online and on-campus students on the same project team. However, one respondent noted that online students may have different backgrounds or time constraints that would make it difficult for them to work with on-campus students on the same assignments.

Several respondents vehemently expressed the opinion that combining online and on-campus sections would not save time. The up-front time commitment to put a course online is very large: videos need to be recorded, online exercises designed. More resources need to be added in the LMS. Teaching an online class for the first time may

be several times as time-intensive as teaching a face-to-face course for the first time. Instructors who report a time savings are probably having their online students watch recordings of classroom lectures. While this is probably the most common way of teaching an online course, it's not the most effective. Online students are often looking for education that they can fit into their schedules. It's more convenient for them to watch five-to-ten minute videos and complete an online exercise afterwards than it is for them to watch an hour-long lecture without any opportunity for interaction.

Many instructors also report that online courses also have more e-mail and online chat communication with students, and this is demanding. If the backgrounds of the two groups of students are dissimilar, it may be necessary to devise separate homework assignments, obviating a large part of the savings.

7. Two schools, one course

Suppose your school doesn't have multiple sections of a course you are teaching. Can you save time by cooperating in course design and coursework with a colleague at another institution? Among our respondents, this was the least popular way to optimize workload: by a margin of 19 to 4, they thought that cooperation would be *more* work. The survey also asked if they had ever done this. Among those who had actually cooperated in teaching a course, the ratio was almost the same: 13 to 3.

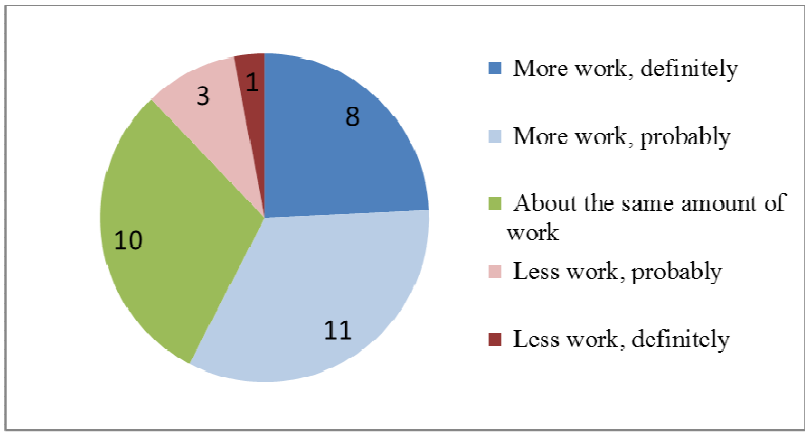

Figure 6. "Was cooperating with an instructor at another school more or less work than teaching the course by yourself?"

Those who thought that cooperation would save time said that the other instructor might have a deeper background in certain areas, allowing both instructors to make unique contributions to the course. A couple of instructors thought it took about the same amount of time as teaching one's own course. One of them said it took more time up front, but less time during delivery, and the other said the opposite.

One of the instructors who thought it would work said that he had experience collaborating with other instructors from his own school, and that it saved time and improved the quality of the class. But cooperation with someone in your department is one thing, and collaboration across schools is another. Student backgrounds vary tremendously across schools; what works for one program may not work elsewhere. The material in a curriculum can be divided in different ways among courses; you may not be able to rely on your students having covered the same topics that your colleagues can. And there are differences in class schedules. Spring break can occur, well, anytime in the spring.

These differences can lead to conflicts on how to teach certain material. One respondent reported, "We spent too much time debating how to teach various things." In fact, communication difficulties were the most frequently reported problems. Two respondents reported that they were collaborating with someone who wanted to be less rigorous than they did. One of them thought the other person was lazy, and wanted him/her to do most of the work. One instructor summed it up this way: "Frustration and distrust may creep into the behavior of the participants, thus affecting the quality and effectiveness of the final product. Compromises during the development of the course content—while necessary—may also lead to feelings of an inferior or substandard course in the end. [10]"

8. Team teaching

Another approach, not mentioned in the survey, is team teaching [12]. Two faculty members take turns teaching a class, perhaps alternating every week or couple of weeks. The instructors attend the classes taught by the other instructor, so they know what is going on and can give feedback to the person teaching.

The advantages of this approach include fewer preparations, and another person with whom to discuss the progress of the course. During any particular week, the non-lecturer may be in charge of preparing assignments. It's also convenient when one instructor travels, e.g., to a conference, because the other instructor can handle the classes. Another advantage is that it is a "gentle" way to introduce a new faculty member to teaching a course.

Potential downsides include the fact that the students may have trouble adapting if the two instructors' teaching styles are very different. Also, this is a more labor-intensive way to cover teaching responsibilities, so instructors would, in the long run, have to teach more courses this way than they would teach solo.

9. Summary

In general, our respondents agree that it is useful to associate course sections in ways that save preparation time. This can be achieved by teaching multiple on-campus sections, combining online with on-campus sections, piggybacking grad courses on undergrad courses, and team teaching. There is much less agreement that all of these techniques represent good pedagogy: piggybacking and combining online with on-campus are are controversial in this respect. One technique, working with a colleague at another institution to develop a course, was seen as more likely to consume time than to save it. In the future, the growing prevalence of “flipped” courses may affect these tradeoffs by increasing the materials that can be shared between on-campus and online courses, and by removing several of the disadvantages to teaching multiple sections in the same semester.

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