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## ARTICLES

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# Benefits and Drawbacks of Using Multiple Instructors to Teach Single Courses

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We set out to identify the benefits and drawbacks of using more than one instructor to teach single section science courses at a large research university. Nine courses were investigated involving widely differing subjects and levels. Teaching models included: sequential teaching with two to six instructors each covering only their own modules, two teachers present in class at all times, and hybrids of these two models. A three-question survey was answered by 957 students and 17 instructors. Dominant advantages identified by both groups were *variety of teaching style or perspectives* and *instructor expertise*, with instructors being more likely to identify *expertise* as the primary advantage. Dominant disadvantages identified were *adjustment to teaching style and expectations* and *confusion and communication* issues. Data suggest that advantages are maximized and disadvantages minimized either in courses with two or more instructors interacting and collaborating in class or when special care is taken with coordination and collaboration if the course is sequentially taught. We conclude with specific recommendations to instructors and departments based on evidence from the data.

**Keywords:** instructor perspectives, multiple instructors, student perspectives, team teaching

Decisions to assign two or more instructors to teach single courses can be made for a variety of reasons. In our department, these reasons have included accommodating instructors' schedules, balancing teaching loads, providing expertise in specific areas covered within one course, or emulating scholarly discussion and communication that occurs in real professional or academic settings. However, the actual impacts on students and instructors of using multiple instructors are not well documented. This study was undertaken in order to investigate those impacts in a variety of courses from both student and instructor perspectives. The intent was to provide strong evidence that could be used to inform future decisions about whether or not to use multiple instructors in the wide range of science courses offered in departments such as ours.

We focus on three questions. First, do students in specific courses consider having multiple instructors an advantage or a disadvantage? Second, what are specific advantages and disadvantages to students, from both students' and instruc-

tors' perspectives? Third, what are specific advantages and disadvantages to instructors and to departments as a whole? Note that we did not investigate the effects of multiple instructors on student learning or performance, but focused instead on articulating the perceived advantages and disadvantages from stakeholders' perspectives.

To address these questions as generally as possible within the context of our own science department, a simple three-question survey was used to gather information from 957 students in nine science courses, and 17 instructors teaching these and other courses. The nine courses were taught in 2009–2010 primarily by tenured or tenure-track research or teaching faculty in a large research university with roughly 40,000 full-time undergraduates. The courses range from 26 to 515 students enrolled, from first-year general science courses to third-year required courses for science majors, and encompass a range of multiple-instructor models.

## Background

There are several models for teaching a single course with multiple instructors (Carpenter, Crawford, and Walden 2007)

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but most fall into one of two basic types. Either there are two or more instructors in the classroom at once, or there is one instructor in the class at a time. In this article we call the first scenario “team teaching” and the second scenario “sequential teaching.” We also consider hybrids of these two types. We do not consider the “parallel teaching” model in which groups of students taking the same course at different times are taught by different instructors (Ennis 1986).

Most reports are positive about the effects of teachers working together as a team within a class (e.g. Carpenter, Crawford, and Walden 2007). For example, students may benefit because true teaching teams can model how experts think, learn, and interact in ways that are difficult for a single instructor (Wenger and Hornyak 1999). Some problems that students identify with team teaching involve issues of communication, organization, and figuring out professors’ expectations or how to earn good grades (Dugan and Letterman 2008). These authors also found no real differences in student attitudes toward team-taught and traditional classes, although students expressed a slight preference for two simultaneous teachers compared to two sequential teachers, which in turn was slightly preferred over three or more teachers. From the instructors’ point of view, team teaching may enable sharing of insights about both content and pedagogy (Lester and Evans 2009). Instructors may also experience enhanced motivation and enthusiasm resulting in an improved class environment and better professional mentoring of students. Although these reports are positive, much of the information is anecdotal or involves small numbers of students, and overall there seems to be little concrete evidence summarizing what students (or instructors) perceive are the advantages and disadvantages of team teaching.

Regarding sequential teaching, interviews with over 60 faculty members at the University of Toronto (Neumann et al. 2006) identified three common themes: the importance of deliberately collaborative behavior among instructors, the need to actively strive for consistency of pedagogy and assessment, and the value of active leadership and coordination. Regarding student perceptions of sequential teaching, Dugan and Letterman (2008) obtained only slight differences in feedback from students experiencing two simultaneous teachers, two sequential teachers, or three or more teachers. In a more general survey targeting students’ whole university experience, Neumann et al. (2007) found that students’ opinions ranged from slightly opposed to slightly in favor of multi-instructor teaching overall. Those who liked multi-instructor teaching tended to like all aspects of it, but the results were not associated with specific courses.

Faculty members in our department identified exposure to multiple research-oriented experts as a benefit to students of using sequential teachers. However, Wenger and Hornyak (1999) suggest that this teaching model may inherently limit learning to factual and conceptual knowledge—i.e., to the bottom third of Bloom’s taxonomy (Anderson, Krathwohl, and Bloom 2001). In addition, there is little evidence for a

correlation between a faculty member’s accomplishment in research and excellence in undergraduate teaching (Feldman 1987; Hattie and Marsh 1996; Marsh and Hattie 2002; Prince, Felder, and Brent 2007). This lack of evidence does not contradict the need for instructors to be proficient in the content they teach. Rather, it is a reminder that an expert’s knowledge about their discipline is not the same as knowledge about how people learn those concepts and skills, and how best to teach them (Bransford et al. 2000). In fact, teaching outside the narrow focus of one’s own area of research is normal for faculty in many institutions (Huston 2009), particularly for graduate students who often get assigned as teaching assistants for subjects in which they are not yet considered experts.

## METHOD

In this study we asked both students and instructors to identify specific advantages and disadvantages of the multiple instructors model used in their particular course. This allows us to go beyond general perceptions and characterize the actual benefits and drawbacks of a variety of multi-instructor models and teaching strategies.

Students in nine courses (table 1) responded at the end of their term to three questions, worded so that students would focus on advantages and disadvantages rather than on “liking” or “disliking,” and on a particular course rather than on multiple instructor situations in general. The three questions posed to students were:

Q1: This course has more than one instructor. What do you think are the advantages of having multiple instructors in this course? Note: this is NOT asking you to evaluate these particular instructors, but to comment on the effects of having multiple instructors.

Q2: This course has more than one instructor. What do you think are the disadvantages of having multiple instructors in this course? Note: this is NOT asking you to evaluate these particular instructors, but to comment on the effects of having multiple instructors.

Q3: All things considered, how do you think having multiple instructors affected this course? It was (a) a large advantage, (b) a small advantage, (c) neutral, (d) a small disadvantage, or (e) a large disadvantage.

Some students completed the survey on paper during class while most completed the survey online outside of class time. In most courses students earned a small amount of extra credit for completing this and other surveys. A total of 924 students from eight of these courses responded to open-ended questions, Q1 and Q2, and 873 students responded to Q3 (table 1). The ninth class yielded data from fewer than 18% of its 216 students, so those results are not used due to concerns about selection bias.

TABLE 1  
Courses Involved, Teaching Models, and Numbers of  
Student Respondents

Course Topic and Level	Teaching Model <sup>a</sup>	Total no. Students	No. Students who Answered	
			Q1 & Q2	Q3
2nd year Environmental Science	TT (2)	40	36	28
3rd year Oceanography	HY (3)	188	131	129
2nd year Earth Science Topics	HY (2)	26	17	17
General Earth Science	SM (6)	515	344	340
General Oceanography	SM (2)	182	107	105
2nd year Majors Geology	SM (2)	103	54	54
2nd year Computer Science	SM (2)	470	203	200
3rd year Majors Geology	SM (2)	41	32	0
Totals			924	873

Note. <sup>a</sup>Teaching model (number of instructors): TT = Team Teaching: all instructors present for all classes and sharing the lead role; HY = Hybrid: all instructors present sometimes, one instructor present other times; SM = Sequential Model: one instructor present at a time.

All written responses to Q1 and Q2 from students were analyzed to identify common themes and to identify interesting specific comments. Once a consistent set of dominant response types was identified for all courses, data were re-coded using codes given in table 2 to ensure consistency across the entire data set. The coding was done primarily by the two authors, and consistency was tested by having both researchers independently code all responses from the third-year Oceanography course. The two sets of codes were consistent to within 3% for responses to Q1 and 7% for responses to Q2. Comments from many students were interpreted using more than one code. For example, the following response to Q1 was coded as both A1 (Variety – teaching style and assessment) and A4 (Expertise): “More variety in teaching styles to suit the student, and instructors are experts in the specific field they teach.”

Instructors were asked the same two open-ended questions as students, but they were told to comment separately on advantages and disadvantages to students, to instructors,

and to the department. Seventeen instructors responded, including 11 who taught in one or more of the nine courses and six who taught in other courses. Eight instructors who taught portions of courses in this study did not provide feedback. Questions to instructors are:

Q1: Your course, “*Course Name*” has more than one instructor. What do you think are the *advantages* of having multiple instructors in this course? Please comment on advantages (a) for students, (b) for you and (c) for your department.

Q2: What do you think are the *disadvantages* of having multiple instructors in this course? Please comment on disadvantages (a) for students, (b) for you and (c) for your department.

We recovered 182 coded comments from all instructor feedback. The same codes identified from student data were used, with some additional codes to accommodate unique perspectives about impacts on instructors and the department.

## RESULTS

### General Perceptions of Multiple Instructors

Student answers to question Q3, summarized in table 3, reveal that multiple instructors may be perceived as advantageous by as many as 100% of students or as few as 14% in any particular course. Table 3 is sorted to establish whether there is any pattern to this wide range of responses. Boundaries between high, moderate, and low rankings of “advantage” in table 3 were tested for significance using two tailed Chi-squared tests (with Yates correction where appropriate) by comparing distributions of student responses, among values in the “Advantage,” “Neutral,” and “Disadvantage” columns. Across the high/moderate boundary, the distribution was significantly different between Gen. Earth Science and third-year Oceanography, ( $p = 0.0003$ ). At the moderate/low boundary, the distribution was significantly different in second-year Majors Geology compared to second-year Computer Science ( $p = 0.0001$ ). Within the

TABLE 2  
Emergent Codes for Questions Q1 and Q2.

Advantages of Multiple Instructors (Q1)	Disadvantages of Multiple Instructors (Q2)
A1. Variety - teaching style and assessment	D1. Adjustment - teaching style (pedagogy)
A2. Variety - personality (perspectives, passion)	D2. Adjustment - assessment (expectations)
A3. Variety - non specific	D3. Adjustment - personal/accessibility
A4. Expertise	D4. Adjustment - non-specific
A5. Conditional (works if. . .)	D5. Confusion - Caused some confusion
A6. None – no advantages	D6. Communication - Lack of effective communication between instructors
A7. Makes no difference	D7. Conditional (Works if. . .)
A8. Other	D8. Makes no difference
A9. No comment	D9. None - no disadvantages
	D10. Other
	D11. No comment

TABLE 3  
Student Responses to Question Q3, Sorted on the “Advantage” Column

Ranking of Advantage	Course	Model <sup>a</sup>	Advantage <sup>b</sup>	Neutral <sup>c</sup>	Disadv <sup>d</sup>
High	2nd year. Earth Science Topics	HY (2)	100%	0%	0%
	2nd year. Environ. Science	TT (2)	81%	19%	0%
	Gen. Earth Science	SM (6)	76%	16%	8%
Moderate	3rd year. Oceanography	HY (3)	58%	22%	19%
	Gen. Oceanography	SM (2)	44%	31%	25%
	2nd year. Majors Geology	SM (2)	35%	39%	26%
Low	2nd year. Computer Science	SM (2)	14%	33%	54%

Note. <sup>a</sup>Teaching models are described in Table 1. <sup>b</sup>Advantage column: percentage of students selecting either large advantage or small advantage. <sup>c</sup>Neutral column: percentage selecting neutral. <sup>d</sup>Disadv (disadvantage) column: percentage selecting small disadvantage or large disadvantage.

moderate category, differences were not significant between third-year Oceanography and General Oceanography, nor between General Oceanography and second-year Majors Geology ( $p = 0.09$  and  $p = 0.53$  respectively).

Evidently, multiple instructors are seen as more advantageous by students in courses taught using team teaching or hybrid models, and less advantageous in courses taught using a sequential model. However, the strong endorsement from the General Earth Science course, and the weaker endorsement from the third-year Oceanography course, suggests that the teaching model alone is not enough to maximize advantages while minimizing disadvantages.

### Specific Advantages and Disadvantages to Students

Open-ended responses to questions Q1 and Q2 tell us what students and instructors think are the actual advantages and disadvantages to students of being taught by multiple instructors. Generally, both students and instructors agree that multiple instructors can be beneficial, and they identify a consistent set of specific benefits and drawbacks. Also, *teaching* and *assessment* issues are generally identified more often as disadvantages than as advantages, while *personality* related matters are more often identified as advantages than as disadvantages.

Specific differences between perceptions of students and instructors are shown using figure 1. Instructors were significantly more likely than students to identify *expertise* ( $p = 0.0003$ ) or *personal perspective and passion* ( $p = 0.03$ ) as advantages of multiple instructor models. (Yates’ correction was applied to the expertise comparison because only four instructors did not mention expertise.) These instructor responses are consistent with findings reviewed by Hattie and Marsh (1996) and Elton (2001) identifying the commonly held but unfounded belief that research expertise is an important precursor to effective undergraduate teaching.

In contrast, students tended to rank *variety of teaching style and assessment* roughly equally with *expertise*. Apparently, students are less convinced that expertise is the principal advantage of multiple instructors. In contrast to instructor

perceptions, these student beliefs are consistent with Bransford et al. (2000), who state “Expertise in a particular domain does not guarantee that one is good at helping others learn it. In fact, expertise can sometimes hurt teaching because many experts forget what is easy and what is difficult for students” (Bransford et al. 2000, 44).

Regarding disadvantages, figure 2 shows that, although students and instructors are generally in agreement, instructors are significantly more likely than students to identify *confusion and communication* ( $p = 3.1E-5$ ). This suggests that instructors are more keenly aware of this problem than students.

Next we compare responses from students in the five sequential model courses to those in the three-team or hybrid courses. Figures 3 and 4 indicate that students learning in team-taught settings consider *perspective* and *expertise* as advantages more often than students taught by one instructor at a time. This preference pattern is similar to data from instructors shown in figure 1, so students in team-taught courses appear to be more in agreement with instructors

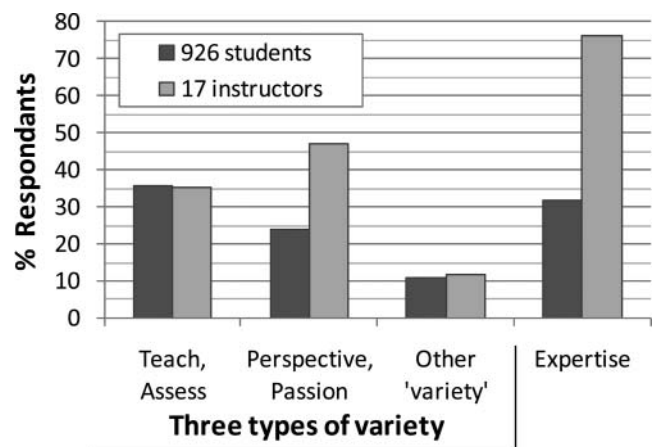


FIGURE 1 Frequency of answer types from all students and instructors regarding advantages to students. Codes were summed over all comments from all courses, and percentages are relative to total numbers of students or instructors. Students provided fewer than 1.3 comments each while instructors provided an average of 2.5 comments each.

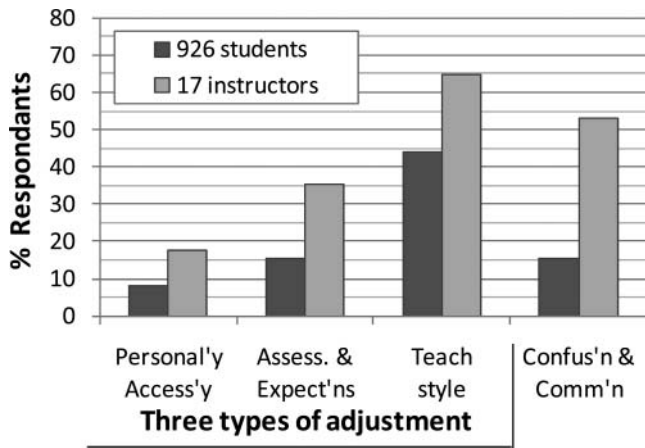


FIGURE 2 Frequency of answer types from all students and instructors regarding disadvantages to students. See figure 1 for additional notes.

(regarding advantages) than students in sequentially taught courses. Considering disadvantages, figure 4 suggests that sequentially taught students are more concerned about having to adjust to teaching style than students in team-taught courses.

Responses about advantages from students in individual courses show four notable observations: (1) *expertise* is referenced as an advantage most frequently in the four most clearly multi-disciplinary courses (first four courses in table 1); (2) third-year Oceanography (the upper level course with the most diverse range of subjects) is the only course from which students identify *variety* (of teaching style, assessments or perspectives) and *expertise* approximately equally as advantages; (3) students in second-year Environmental Science (the only truly team-taught course), are more prone to identifying “*other*” advantages (type A8 in table 2) than students in other courses. Remarks such as “. . .

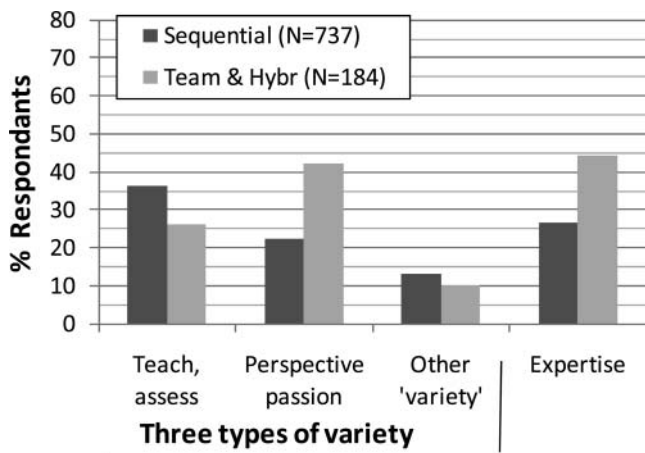


FIGURE 3 Frequency of answer types regarding advantages to students, from students in all sequential model courses and all team or hybrid model courses. Percentages are relative to total numbers of students in each group. The vertical scale was set to facilitate comparison with figures 1 and 2.

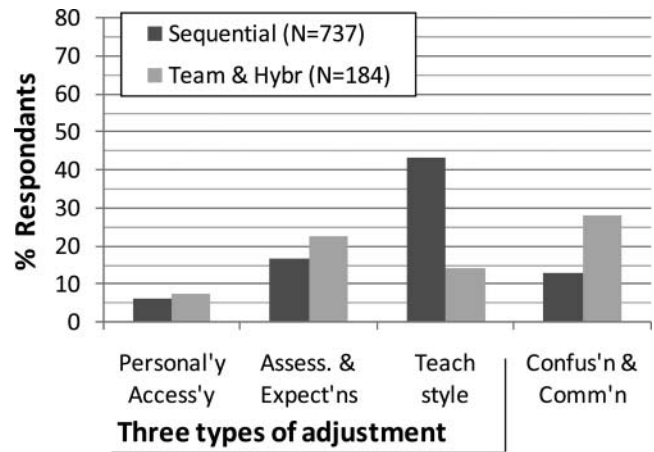


FIGURE 4 Frequency of answer types regarding disadvantages to students. See figure 3 for further notes.

[instructors] working together enriched the class; they could bounce ideas off each other”, and “. . . you could see how they interacted . . .” show that students recognize true team teaching as bringing aspects of expert thinking, communication and discussion into the class; (4) from the second-year computer science (the course that is most like two “mini courses”), 20% of respondents specifically indicate they saw no advantages to the multiple instructor model.

Regarding specific disadvantages, four notable observations are (1) students in second-year Earth Science Topics (in which instructors are in class as a team for roughly half the time) were least likely to identify *adjustments* of any kind as a disadvantage; instead, they referred most often to *confusion*; (2) in second-year Earth Science Topics and 2nd year Environmental Science (the partially or fully team-taught courses), students were more likely to say there were no disadvantages; (3) *adjustments* was identified almost to the exclusion of other disadvantages by students from General Earth Science, second-year Majors Geology and second-year Computer Science; (4) students in 2nd year Majors Geology and second-year Computer Science did not generally approve of multiple instructors (Q3 results in table 3) and adjusting to the different instructors was identified as the main disadvantage.

Responses from the General Earth Science course are particularly interesting because it is the most extreme version of sequential teaching (see table 1), yet students indicated they consider multiple instructors an advantage in this course. *Adjusting to teaching styles* of six different instructors was noted above as the principle disadvantage, while *expertise* and *variety* were identified as advantages. Also, Q3 results (table 3) show that overall, students approve of multiple instructors in this course. A likely reason for this unexpected result is that this is the only course with a designated lead instructor in charge of coordinating lessons, online resources, exam questions, and for mentoring new instructors.

TABLE 4  
Advantages and Disadvantages to Instructors

Row	Advantages to Instructors	Disadvantages to Instructors
1	Flexibility with time (9) and reduced workload (1)	Extra time needed (9), and complexity (5)
2	Collaboration and mentoring (9)	Incompatibility, poor communication, need to adjust personal style (7)
3	Aspects of expertise (8)	Frustration and less freedom (5)
4		Lack of commitment (1) and poorer connection with students (1)

Note. Data are from instructor responses only. Numbers in brackets are the numbers of instructors, of 17 total, who made the comment.

### Advantages and Disadvantages by Gender, Degree, and Experience

General science courses in particular cater to a wide variety of students, so, in the one course where some demographic data were available (General Oceanography), we investigated whether opinions varied by gender, degree (bachelor of arts, BA, versus bachelor of science, BSc) or number of years in their degree program (one or two years versus three or more years). In this course, responses do appear to depend somewhat upon these variables, although there is no information about causes for differences between groups. For example, first- and second-year students are more concerned about *adjusting to teaching styles*, while third- and fourth-year students are more concerned about *adjustment to assessments and expectations*. Regarding question Q3, females in this course are 19 percentage points more neutral, and males are 21 percentage points more positive, but neither group is strongly negative.

### Perspectives From Individual Students

The results presented above summarize collective trends, but particular comments from individual students also provided useful insight. For example, individual comments from General Oceanography include “The teacher cannot build on examples that students have generated when the other instructor was teaching.” Such remarks highlight the need for instructors to know what their colleagues are doing. Problems resolving topics or class discussions are also identified by students with comments such as, “I was not sure who was right”, or “how were we to take everyone’s perspective into account?” The importance of resolving team-taught segments is also noted by Wenger and Hornyak (1999) and is a fundamental component of working with teams in any set-

ting (Stanfield 2000). A further example of good advice to instructors comes from a student in third-year Oceanography who noted “Instructors can help out each other.”

Finally, students who experienced true team teaching clearly appreciated the benefits. For example, comments from second-year Earth Science Topics include “. . . they worked together instead of alternating classes like some of my other courses,” “it helped create a great atmosphere in the classroom that this class is about discussion and participation and not just one person lecturing at you,” and “it made the class more fun.” These and many other examples from all nine courses demonstrate how individual students can provide insightful information, which helps identify what is working and ways of addressing aspects that need improvement.

### Advantages and Disadvantages to Instructors and Departments

Although effects on student learning are paramount, these teaching models also have advantages and disadvantages for instructors themselves, and for their departments. These are elucidated by responses from the 17 instructors who provided feedback (tables 4 and 5). One of the main concerns for instructors is time (row one of both tables 4 and 5). They note that multiple instructor models may increase flexibility (e.g. to attend meetings or do field work), but the total time commitment also increases because of the need for planning and coordination.

Instructors consistently identify collaboration and mentoring as a potential advantage. To quote one instructor, “I learn an enormous amount by interacting with another colleague in course creation, modification, and maintenance.” However, corresponding difficulties include incompatibility within the team, poor communication, or reduced freedom to teach as

TABLE 5  
Advantages and Disadvantages to the Department

Row	Advantages to the Department	Disadvantages to the Department
1	Flexibility with time (5)	Extra time and fairness (5)
2	Expertise and breadth of coverage (6)	Complexity of management and frustration (4)
3	Economic benefits (3)	Increased costs (2)
4	Enhanced reputation for the Department (3)	Reduced reputation (2)
5	Enhanced collegiality and mentoring (3)	‘none’ or ‘not sure’ (3)

Note. Data are from instructor responses only. Numbers in brackets are the numbers of instructors, of 17 total, who made the comment.

one pleases (rows two and three of table 4). These results are consistent with Carpenter, Crawford, and Walden (2007) who also identify collaboration and mentoring as benefits of multiple instructors, especially when teaming an experienced instructor with one who is new to the particular course. Collaboration may be particularly beneficial for faculty who are not otherwise likely to collaborate intellectually.

Instructors like being allowed to teach more within their own area of expertise. For example, one instructor stated, "I don't have to give lectures on topics too remote from my research area." They also suggested that having experts in first year classes might benefit the department by attracting students into corresponding degree programs. However, maintaining teaching quality and enthusiasm, lack of commitment or freedom, and poorer connection with students (especially when teaching only small portions of a course) were all recognized as challenges (table 4 row 3 and table 5 row 2). Also, teaching somewhat outside one's own specialization can be considered an opportunity rather than a problem (Huston, 2009), especially at the first- or second-year level.

Table 5 rows 3 and 4 suggest that multiple instructors could result in either increases or reductions in cost or reputation. This apparent contradiction can be reconciled if a department's teaching reputation is related to course or instructor evaluations and student word-of-mouth. In other words, improving courses with multiple instructors can result in improved reputation, but that requires an increase in costs represented by devoting additional total faculty time and care to the course. Evidently these pros and cons identified by instructors demonstrate that they recognize how actions that promote benefits or reduce problems will probably have associated costs.

Finally, from informal interviews with administrative staff, one impact on departments not identified in table 5 is the increased complexity and cost of managing course scheduling within institutional and personal constraints.

## Recommendations

This study set out primarily to identify advantages and disadvantages, not to determine details about strategies that support advantages or suppress disadvantages. Establishing such causes and effects could be the subject of a different, more detailed study. However, our data do provide some insight about what seems to be working and what apparently causes problems in particular classes. Bearing in mind that every course and department is unique, our results support the following practical (and hopefully adaptable) recommendations about how to use multiple instructors in single courses.

- (1) Carefully consider whether in fact multiple instructors are appropriate.
  - a. Use multiple instructors when course learning goals include (a) improving scholarly skills and attitudes, (b) developing multi-disciplinary

knowledge and skills in senior courses, and possibly (c) developing specific student expertise guided by content specialists.

- b. If expertise is a concern, scrutinize the course's learning goals to consider what degree of expertise is really needed to teach the types of students taking the course, especially for first- and second-year courses. Our data suggest that for most courses, instructors working in teaching teams should worry more about consistent and collaborative teaching than about whether they are specialists in the discipline.
  - c. Multiple instructors can be successfully used to introduce many students to the diversity of a discipline, however, success in this case depends on using a well organized and collaborative approach in all aspects of the course.
- (2) Actively and visibly (to students) reduce confusion by minimizing the adjustments students must make to the various teaching and assessment styles of the teaching team. Examples of strategies include:
    - a. Explain to students the intentions and reasons for using multiple instructors, both in writing (e.g., the syllabus) and verbally throughout the term.
    - b. Meet with co-instructors regularly (e.g., weekly), even if meetings are brief.
    - c. Agree ahead of time about expectations, teaching strategies, and class procedures, especially with younger students.
    - d. All instructors should try as much as possible to use similar pedagogies and assessment formats throughout. At the very least, never surprise students with a strategy or assessment format they were not expecting.
    - e. If teaching sequentially, attend at least a few classes taught by co-instructors.
    - f. Provide bridging segments between instructors and take time to resolve the differences between perspectives or coverage.
    - g. Use occasional simple surveys to obtain feedback about what is or is not working. Deliberately respond to this student feedback, so students know they have been heard. Explain why your team is taking some suggestions and not others. Follow through with any changes you agree to implement.
  - (3) Build an effective teaching team.
    - a. Potential team members should participate in decisions. Each individual should be on the team because they bring a unique personal or professional perspective to the course.
    - b. Do not use multiple instructors for the sake of economy. No one saves time when working as part of a teaching team.

- c. Team members should treat the experience as an opportunity to increase collaboration, mutual support, and mentoring opportunities.
- (4) Finally, keep in mind that not all courses are the same. Our data suggest that different strategies succeed in different situations.

## Conclusions

We used data from 924 students and 17 instructors in eight different courses to determine (a) whether students consider multiple instructors an advantage or a disadvantage, (b) the specific advantages and disadvantages to students (from both students' and instructors' perspectives), and (c) particular advantages and disadvantages to instructors and to departments as a whole. Overall, three broadly applicable messages emerge from this diverse data set. First, and most important, multiple instructors can provide positive, productive experiences for students and instructors so long as extra care and time is taken to both minimize adjustments students must make, and avoid sources of confusion. In other words, there must be good reasons for teaching one course with two or more instructors if the costs of avoiding negative impacts are to be justified. Therefore, assigning multiple instructors is not a simple approach to balancing teaching loads because extra time is needed for any multiple instructor model to be effective.

Second, students viewed expertise as an advantage, but not overwhelmingly, while instructors felt expertise was a dominant advantage. We believe there is sufficient evidence in the literature and from our data to argue that expertise should not necessarily be used as a reason for assigning multiple instructors, especially in general overview courses in which breadth or diversity of coverage is emphasized over depth or detail of treatment in course topics.

The third message suggested by our data is that more collaborative instructing models can have clear benefits. When instructors work together to produce a course with uniform purposes, expectations, and "look-and-feel" then the advantages identified by students and instructors can outweigh the disadvantages. In particular, although it may be expensive in time and energy, multiple instructors working together in a classroom can be especially effective at meeting high level learning goals related to improving expert-like understanding and behaviors. In contrast, multiple instructors teaching alone and rarely interacting with each other was found to be the least effective model.

The principal strategy for maximizing advantages while minimizing disadvantages is to ensure that multiple instructors work as a team, even when the teaching is done individually in sequence. Research faculty are experienced at working in research teams, and similar strategies are needed to ensure that students in multi-instructor courses have predictable learning experiences that are driven by well-defined and consistent learning goals, expectations and challenges.

## ACKNOWLEDGMENTS

We thank Wendy Adams and Sarah Gilbert for advice regarding data analysis and writing, Sarah Henderson and Carrie Wong for assisting with data coding and background research, and the students and instructors who participated in these surveys. Feedback from anonymous reviewers has also been crucial in helping improve the article. This work was made possible by the Carl Wieman Science Education Initiative at the University of British Columbia.

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