FEATURED TOPIC

Interdisciplinary

An Alternative to Traditional Majors and Minors

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It is the nature of real-world problems that they are ill-defined and ill-structured, and the sooner students learn to deal with such problems, the better

CONSIDER FOUR DISTINCT PROBLEMS confronting society in recent times, today, and perhaps, in the future: (1) finding a way to manage—or ideally eradicate—epidemics (e.g., AIDS, SARS, perhaps avian flu); (2) achieving ways to manage or eliminate terrorism and terrorist attacks; (3) finding ways to combat global warming and related changes in the atmosphere before it is too late to keep the earth habitable to humans; and (4) developing positive, effective, ethical leaders who have at heart the best interests of all their stakeholders, rather than primarily their own interests or those of groups to which they feel they owe allegiance as a result of family, tribal, political party, economic, or religious ties. These four major problems, in common with virtually all problems facing the world, can be solved only through multidisciplinary thinking. They very well could form the bases for problem-based majors and minors in university settings.

Consider, for example, the management of epidemics. Successful management of epidemics may well require biologists to understand the cellular mechanisms by which diseases cause harm, medical researchers to study potential cures, epidemiologists to understand how the diseases spread, psychologists to understand how people can be persuaded to behave in ways to minimize spread of the diseases, political scientists to weigh in on how to work with governments to adopt national and international policies that promote disease prevention, economists to study the costs of and funding mechanisms for managing epidemics, sociologists to understand how societies perceive health threats and react to them, historians to see whether we can learn from the past so as not to repeat mistakes, and perhaps others as well. Ideally, a single individual would have some background in each of the areas so that he or she can understand the issues from a variety of disciplinary standpoints, rather than just his or her own. In the absence of such background, the individual is like the blind person feeling one part of an elephant, but not understanding that it is an elephant that he or she is feeling.

Similarly, the problem of confronting global warming is an interdisciplinary one. In his movie, *An Inconvenient Truth*, Al Gore draws

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Problem-Based Learning

on a wide variety of integrated disciplines to discuss the problem of combating global warming, including film studies, meteorology, political science, psychology, economics, graphic design (in the creation of effective charts), and history, among others.

Responding to the four major problems mentioned above—and indeed, almost any serious problem at a global or even national or local level—requires problem-based, interdisciplinary thinking. If this is the case, then is it time to think seriously about alternatives to the traditional undergraduate "major," which, in the large majority of cases, tends to be focused on just a single field of inquiry?

A problem-based approach

The current idea of a major (or minor) subject may have made more sense in a less complex and interconnected world in which the perspective and method of one discipline could be applied to a fairly confined and narrow problem. In today's world, however, few problems of any significance are either confined or narrow. Rather, they aggressively cross boundaries that render the perspectives and methods of single disciplines incomplete and inefficacious. In effect, then, we are teaching undergraduates to think in ways that may prepare them less than adequately for the problems they will face once they leave the college environment and face the outside world.

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Of course, a liberal arts education teaches students course content from a variety of disciplines, with most of the general education occurring during the first two years of the college experience. The problem is that students learn to think in terms of silos, but do not learn how to connect the silos of learning. It is rare that students are taught how to integrate what they learn in the various subjects they study, despite the fact that such integration is, arguably, what is most important in solving real-world problems.

A problem-based approach puts the problems before the tools

The current system poses three problems. First, in the first two years of college, students learn to think in silos rather than in an interconnected, multidisciplinary way. A problem-based major or minor provides a way for students to see beyond such silos. Second, when they major (and possibly minor), students learn to think more deeply in one or perhaps, in the case of double majors, two of these silos, still without learning what is most important: how to integrate the knowledge across silos. A problem-based approach teaches such integration of knowledge. Third, students may not realize how limited their thinking is. Like the carpenter desperately looking for some task in which to use a hammer, the student may come to believe that his or her field provides *the* answers, and that practitioners in other fields have less to offer in the solution of complex problems. A problem-based approach puts the problems before the tools.

As an example, an economist may come to view the world in terms of idealized economic models, paying too little attention to the psychological factors that may contribute to the solution of complex problems; conversely, a psychologist may not fully appreciate the economic problems inhering, say, in the management of mental health care.

In order to prepare students for today's complex world, some schools engage students in problem-based learning, trying to hone the students' skills in applying what they learn to the kinds of problems they are likely to face. But more often than not, problem-based learning is employed within the silo of a single discipline, rather than across multiple disciplines. The result may be a false sense of security in approaching problems from a unidisciplinary perspective.

Many colleges and universities have started at least some interdisciplinary majors (and minors). For example, at Tufts University, we have majors such as community health, peace and justice studies, and international relations, and we are starting a minor in leadership. Such interdisciplinary majors are often popular, but may also be viewed by faculty with some suspicion because they are not conducted under the auspices of any one department. Moreover, even they may consist of sequences of isolated courses, where it is left to the student

to draw the connections among the various disciplines and how they approach problems. This is asking a lot of students, as drawing such connections challenges even the faculty who teach the students.

Perhaps it is time to think not only about problem-based learning within disciplines, but also about problem-based major and minor subjects. Clearly, the problem a student might study in such a major or minor—for example, one of the four major problems identified above—is not the only problem a student will ever confront. But what a problem-based major or minor can do is teach students the knowledge and skills needed to think in an interdisciplinary way, so that such thinking is seen as a model for the kind of thinking needed to solve any serious problem. Such majors and minors need not replace traditional ones, but might supplement them as a viable option for many students.

An assumption of the kind of program I sketch is that learning approaches to the acquisition and utilization of knowledge are, in the long run, more important, at least to most people, than is the particular subject matter at a fixed point in time of any one discipline. For example, it is more important to acquire the perspectives of psychologists, economists, historians, chemists, musicians, or philosophers than it is to learn all of the knowledge that currently is taught within the context of a single-disciplinary undergraduate major.

There are three reasons why approaches and modes of thinking are of primary importance in undergraduate education. First, for those who truly want to specialize in great depth, they have the option of going to graduate or professional school and becoming deeply steeped in a discipline. Often, however, students specialize by virtue of the jobs they hold, not necessarily only by virtue of the formal education they receive. Second, no matter how much material one puts in a single silo, the absence of a connection to other silos is what will prevent the problem-solver from being able fully to grasp the essence of a problem and how to solve it in a multidisciplinary way. Third, knowledge becomes outdated very quickly today, or it is limited in terms of its applicability to real-world problems. For example, in my own field of psychology, there is precious little overlap between the content being taught in introductory courses today and the content taught in 1968, when I studied introductory psychology.

Principles for forming a problem-based major or minor

How might one go about forming a problem-based major or minor? I suggest six principles for the construction of such courses of study. First, the problems constituting the majors or minors must be truly complex, engaging, and relevant to the concerns facing the world—yesterday, today, and tomorrow. Students will learn best if they are facing large, real problems in their full contexts, rather than small, artificial, or context-limited problems. The problems can be expected to differ across time and space.

Second, the course of study must be truly interdisciplinary. It needs to recognize that complex problems are not solved in a unidisciplinary or even dual-disciplinary way. The program must include instruction that crosses a variety of disciplines, likely bridging aspects of the humanities, arts, social sciences, and natural sciences.

Third, the instruction must be *truly* transdisciplinary, bridging silos rather than merely teaching an amalgam of courses across different disciplines. In all likelihood, such instruction would involve instructors working together across disciplinary boundaries to teach students to think across disciplines in solving problems. An advantage of this kind of teaching is that the instructors may learn just as much as, or more than, their students.

Fourth, assessment of performance must go beyond traditional disciplinary boundaries, involving projects and other forms of performance that encourage students to apply the full range of what they have learned to the solution of problems. Assessment of progress is likely to involve the efforts of faculty across and not just within disciplines.

Fifth, students must be shown the benefits of the new approach. Students and their parents are often among the more conservative elements in a college or university environment. They often want the traditional rewards of a college education, such as a better job or better admission prospects for the future. Changes in curriculum need to be linked, for them, to enhanced future outcomes. At the same time, employers and graduate and professional schools need to be sold on the idea that the problem-solving skills and attitudes acquired in a problem-based major or minor will be highly useful in the world. The students learn better tools for thinking, and to useful ends.

Sixth, faculty need to be rewarded for participating in such problem-based ventures. The form of reward will depend on the particular situation of the college or university. But if they are expected to take on more than they have done in the past, there needs to be, at the very least, recognition of service, and in all likelihood, a temporary reduction of other responsibilities as they construct new courses based on interdisciplinary, problem-based learning.

Most importantly, students will learn to think across rather than merely within silos

An interdisciplinary, problem-based leadership minor

An example of the kind of program I am describing here is a program based on the problem of how one can create positive, effective, ethical leaders for the world of the future (the last of the four major problems identified at the beginning of this article). At Tufts, we are creating an interdisciplinary, problem-based leadership minor to enable all interested students to learn the skills and attitudes that are essential to positive, effective, ethical leadership. The minor consists of three tiers.

The first tier involves courses across the disciplines that directly teach about leadership—theories of leadership, research on leadership, cases studies of leadership, ethics, and so forth. The second tier involves courses in the entire range of the liberal arts that pertain to leadership, but do not directly teach it. Students might learn about leadership through literature (the foibles of Othello or King Lear), philosophy (Plato's or Aristotle's views of leadership), the history of art (how great artists have depicted leaders at different times and what these depictions show about their views of leadership), political science (theories of presidential leadership or leadership as it applies in different forms of government), history (studies of successful and failed leaders throughout history), psychology (interactions between persons and situations that lead to successful leadership), sociology (leadership of social movements), anthropology (conceptions of leadership in diverse cultures), the sciences (the role of good taste in problems in scientific leadership, the interaction between theory and data in scientific advances), and so forth.

The third tier involves a substantial leadership experience and a reflective paper written about it that shows how what one learned in the first two more academic tiers can be applied in the third, more practical tier. The paper should be interdisciplinary, cutting across the various disciplines that contribute to a comprehensive understanding of what constitutes good and effective leadership, from local to global levels. It provides a chance to put together all one has learned in the various courses one has taken.

Some might argue that what constitutes good leadership—or addressing problems of epidemics or global warming—cannot be directly taught, as no one is sure of the answers. This is probably true. But it is the nature of real-world problems that they are ill-defined and ill-structured, and the sooner students learn to deal with such problems, the better. What one can do is to create the kinds of experiences that enable students to learn about leadership, global warming, or anything else.

In my own undergraduate course on the nature of leadership, I design a series of experiences that enable students to learn what it means to be a leader. As in most other courses, I use books, articles, and some lectures. But the course also contains more distinctive features. Every class except the first and the last features a leader taken from industry, finance, government, religion, education, consulting, or some other field, who talks to students for a quarter of an hour about his or her own practice of leadership, and then engages the students for another three-quarters of an hour in a dialogue on how they can apply the individual's ideas to their own lives. In this way, students learn from diverse leaders in the everyday world how principles can be transformed into practices. This is the most popular part of the course, as it exposes students to the thoughts and actions of people confronting real problems in real jobs.

Almost all of the classes also include active learning about leadership. For example, in the first class of the semester, after I reviewed the syllabus, an individual in the class spoke up, loudly and obnoxiously complaining about the syllabus and how unreasonable it was. Other students were flabbergasted until I thanked and dismissed the individual, who was a shill I had planted in the classroom. I then pointed out to the students that in leadership roles, the question is not whether someone will publicly

challenge your authority, but rather, how you, as a leader, deal with such challenges to your authority. I then divided the class into three groups, and had each group simulate how it would handle public challenges of this kind. In another exercise, I taught in a blatantly incompetent way for five minutes. I then pointed out that leaders always encounter, sooner or later, incompetent team members who drag down their team but who the leader is unable, for one reason or another, to remove from the team. Three teams then had to simulate how they would handle an incompetent superior, coordinate, or subordinate member of their work team. In yet another class, students had to hire a team member (a dean), going through the steps of choosing the team member—from vision statement to job interview to the interview in which the team attempts to persuade the selected candidate to take the position.

Students also were actively involved in interviewing a leader, analyzing his or her leadership, and evaluating their own leadership. They further analyzed, as a team, the leadership of a well-known leader. Groups selected leaders as diverse as Bill Clinton, Bill Gates, and Kenneth Lay.

The goal of a leadership minor, then, is to prepare students to be in the vanguard of new leaders for a changing world. Rather than hope students will inadvertently pick up the skills of good and effective leadership, the minor helps ensure, to the extent possible, that they do. Most gratifying to me was when a student from the class came to my office this spring and said that he and other students had been observing that the course differed from many others in that the students could use what they had learned in the course almost every day of their lives.

How to create positive leaders is only one example of the kinds of problems students might confront in a problem-based major or minor. Other topics, such as how to deal with epidemics or other catastrophes, how to deal with global warming, or how to deal with human conflicts, also form bases for such academic programs. In the end, problems are interrelated. For example, there are many elements of crises that are the same, regardless of their particular content—whether it is war against an epidemic, global warming, terrorism, or corruption in leadership. Problem-based major and minor subjects will enable students to learn the wide variety of knowledge, skills, perspectives, and attitudes that will enable them to solve the wide variety of problems they will face in their lives. Most importantly, students will learn to think across rather than merely within silos—to see problems in their full complexity rather than in the limited ways any single discipline can bring to bear.

Conclusion

The proposal in this article is not without challenges. Colleges and universities, and the stakeholders within them, are used to traditional majors and minors, and have based their instruction for many years on this traditional system. Problem-based study would cause some dislocation for those used to the traditional system. But I view problem-based majors and minors as a supplement to traditional offerings, rather than a replacement. Undoubtedly, most students would continue to major in traditional fields of study, which have served as useful bases for undergraduate education in the past and will continue to do so in the future. Students should have the option of choosing what they want to learn, and teachers the option of choosing what they want to teach.

The kind of system proposed here is not altogether new. Many colleges already have problem-based offerings. Tufts University is one. Wheaton College in Norton, Massachusetts, is another. At Wheaton, there is a program that enables students to explore different areas of knowledge and different approaches to problems in an integrated way. At Hollins University, students can study a concept such as human freedom from multidisciplinary standpoints, such as philosophy, psychology, sociology, and political science. At the University of Virginia, there are multidisciplinary majors such as medical ethics. So the seeds of the kind of system described in this article already exist.

Such a system would probably have to be phased in over a period of years, but it would not replace more traditional offerings. Phasing it in would have one great advantage: it would prepare students to think in an interdisciplinary way so that, when they are confronted with the problems of tomorrow, they start with the problem rather than with their toolbox, and then work with others to choose the set of toolboxes that will best address the problem at hand. □

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