Rethinking the Large Lecture:

Teaching and Learning at Scale

Andrew Hamilton
Academic Affairs
University of Houston

Summary: Contemporary students are studying less, learning less, paying more, and getting better grades than previous cohorts. College-level learners and course delivery possibilities have changed drastically in the last two decades, while teaching practices have changed very little. The large, introductory lecture is at many universities a DWIF leader. It is time to rethink lecture practices in the light of new technologies as well as current research about who students are and what they need. It may well be a good idea to get rid of the lecture altogether, replacing it with a suite of practices aimed at more structured student engagement with the material, more and better faculty-student interactions, and better mechanisms for providing students with feedback on their work. There are ways, however, to encourage student engagement in the context of the lecture course, including structuring student preparation time more carefully. The best course of action will likely require a broader conversation about what an excellent 21st century education should be.

1. Introduction: Reasons for Concern

The four-year degree is an important predictor of career success and socio-economic mobility (Elman and Rand 2004; Ng et al. 2005). It has also become a near requirement for having a career at all. As the educational expectations of employers have risen over the last three decades, students have responded by enrolling in college in record numbers. According to data synthesized by the National Center for Education Statistics, US institutions of higher education saw a 39% increase in enrollments in the decade that began in 1999. The Pew Research Center reported that in 2008 39.6% of all Americans between the ages of 18 and 24 were enrolled in some kind of institution of higher learning. In 2009, nearly a third of Americans had completed bachelor's degrees, compared to 5% in 1940 and 16% in 1970 (Ryan and Siebens 2012). The Obama administration has recently announced a set of initiatives that would significantly increase the number of Americans who hold postsecondary certificates and degrees.

While the enrollment numbers seem to show that business is good at US colleges, costs to students have risen much faster than the rate of inflation, even as the quality of education has plummeted. As states massively disinvest in universities, students take on more of the true costs of their studies. The decade that began in 1999 not only saw an explosion in enrollments, but also in student loan debt: analysis of New York Federal Reserve data shows that student loan debt increased by more than 500% between the first quarter of 1999 and the first quarter of 2011. The Federal Reserve Bank of New York's May 2012 *Quarterly Report on Household Debt and Credit* puts the average student loan debt at a little more than $23,000, with 37 million borrowers.

While costs and enrollments rise, important metrics of post-secondary educational quality are all trending in the wrong direction. In 2009, the National Assessment of Adult Literacy found troubling declines in document and prose literacy among college graduates. Studies published in the last few years have demonstrated that student study time has fallen sharply in the last two decades (Babcock and Marks 2010, National Survey on Student Engagement 2011), and there is reason to believe that US higher education is failing in what it often says is its most central educational task: the production of adults who are capable of reasoned and critical thinking, writing, and discussion (Arum and Roksa 2011).

It is worth pointing out that while students seem to be learning little by some metrics, they are not failing to perform. As Figure 1 shows, their grades have never been better. Today's students are doing exactly what students have always done: they are working to expectations. As they learn less than past cohorts, they are rewarded by an institutional structure that strongly favors faculty research productivity over student learning. While it may be true that students are doing poorly, it isn't because they're dumb or lazy. They just aren't getting what they're paying (more) for. The reasons for this are not new, but the gaps between what is good for faculty and for institutions of higher learning on the one hand and for students on the other may be widening.

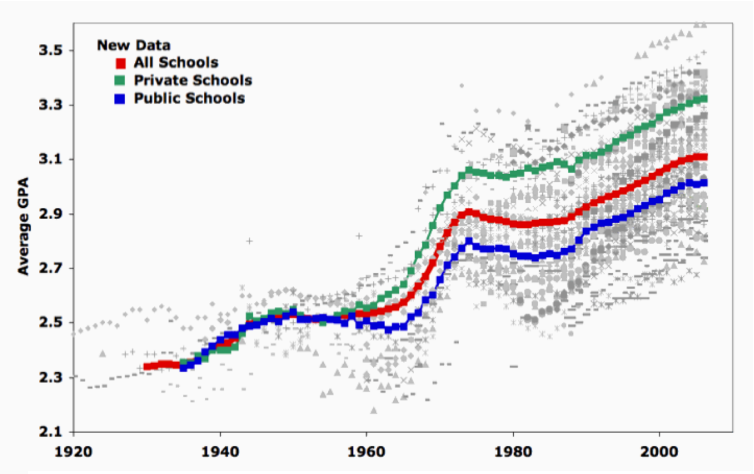

Figure 1: Grades in the United States over time. Data and figure from Rojstaczer and Healy 2010.

As several commentators have noted, many trends in the data gesture at deep and serious problems with higher education infrastructure. Less noticed, however, is what these trends might mean for particular instructors in particular classrooms. What are the students like, and what might it mean to teach them effectively? In particular, what does the current state of affairs mean for the kind of class with the highest DWIF rates at most institutions—the large, introductory lecture course?

2. A Crisis of Time; A Crisis of Engagement

While the large lecture course was probably never ideal from a pedagogical perspective, it has served an important role in universities for a very long time. It has been a cost-effective way to offer surveys of disciplines for a lot of students, preparing them for more work in the same field or pointing them toward basic literacy about it. Faculty have invested considerable time in building these courses and in writing and fine-tuning lectures that cover wide swatches of knowledge in a single academic term. Many thousands of graduate students have learned to teach partly through being assistants in lecture courses. A well-delivered lecture in a well-structured course is truly a thing of beauty, difficult and rare. It also doesn't work, even when it's great, for most students most of the time.

This isn't really news. Education experts, psychologists, sociologists of education, and other experts have been pointing out at least since the 1960s that the basic 'passive' lecture presentation—still the most common practice in large survey courses by far—is probably hopeless. In a well-cited study, Edgar Dale (1969) found that students recalled about 25% of lecture content three hours after the lecture, and somewhere between 10% and 20% after three days. More recent studies argue for lower numbers, with Donald Bligh (2000) finding less than 10% retention after three days for most students.

If information retention in the lecture context has indeed gotten worse over the past half century, we should not be surprised: retention after the fact usually requires preparation before the fact, and in this task faculty and students are failing *miserably*. The cohort of students Dale observed would have spent approximately twenty-five hours each week engaged in academic activities outside of class. They could reliably be counted on to do the reading. This situation has changed dramatically (Figure 2). Today's students spend less than half as much time preparing for class, doing assignments, and studying for tests as their 1960's-era predecessors. The class of 2017 will spend *most* of its academic time in class. For the first time in modern history, American students are spending more of their academic time in class than in preparing for class. A recent study by Babcock and Marks (2011) revealed that the total academic call on

contemporary university students' time amounts to about twenty-seven hours per week. Daniel de Vise at the *Washington Post* has pointed out that "this is roughly the same time commitment expected of students in a modern full-day kindergarten." Anthropologist Rebekah Nathan (2005) offered insights into higher education by becoming a freshman again. After her year in the dorms, she concluded that intellectual life is "not a significant part of college culture."

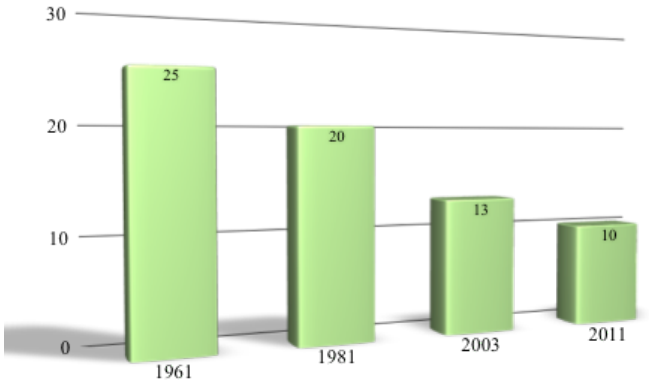

Figure 2: Student study habits over time, measured in hours spent studying outside of class (*y* axis). Data compiled from Babcock and Marks (2011) and from the National Survey of Student Engagement (2010).

The problem here is not really with the lecture, but rather with the lecture in the current learning context.[1] Standard passive lectures are structured in ways that ask for significant contributions from students. This is one reason why the "traditional effort standard" is about thirty hours of student study time per week (Babcock and Marks 2010). Administrators and instructors have said for decades that students should dedicate two or three hours of study time each week for every hour of class time. A quick web search will reveal that this is still what students are told. The City University of New York's webpage is typical: CUNY calculates that if students want to get a C, they need to put in between six and thirteen hours of study time per course each week, depending on the course. There is a significant disconnect between advice like this and the truth, but this isn't the biggest issue. What's more troubling is that we know our curriculum and pedagogy are structured to require significant student investment if they are to learn and we also know that students don't make the investment.

If students don't do the reading, it's hard to see how they might engage their courses effectively. They will not show up wondering about the connections between two ideas in the text, and thus have at least a framework for structuring their consumption of the day's material. If they have not reviewed previous lectures carefully, they cannot become puzzled about apparent inconsistencies between content presented across lecture sessions. In short, if they aren't engaged in the course, even a very good lecture is not likely to have much impact on most students. What sense can an underprepared student make of the approximately 140 words per minute uttered by the average lecture instructor (Robinson et al. 1997)? We have strong reasons, both from anecdotal instructor experience and from research, to suspect that most students do not prepare in ways that will make lectures effective tools of instruction, but we lecture anyway. Experienced instructors are also aware that the technology students bring with them can be a serious hindrance to learning. Even the very best teachers have a hard time competing with games, movies, and Facebook for a generation in which the majority of 16–22 year olds would rather give up the sense of smell than their technology (McCann Worldgroup 2011).

Lack of engagement, however, is not solely a failure on the part of the student. We should resist the easy conclusion that lectures are poor tools of instruction because today's students are stupid or lazy. Their lack of engagement, which perhaps has now reached crisis levels, is driven by complex relationships between preparation for college, instructor expectations, and some newly intensified time-management challenges associated with changes in educational costs. Higher education has changed in the last two decades. We

[1] It should be noted that there is evidence from the literature on mastery learning that lecturing alone produces much poorer results than lecturing *and* requiring mastery before students can move from earlier topics to later ones (Bloom 1984; Kulik et al. 1990; Guskey 2001).

don't just have more students; we have different students. Many of the more than twenty million students who will enroll in the fall of 2012 differ importantly from their parents' generation in skills, desires, motivations, and relationships to higher education.

2.1. Who Our Students Are

There are many more first-generation college students than there were a decade or two ago (though the Higher Education Research Institute points out that the proportion of first-generation students has been declining since the 1970's). These students have greater retention and completion challenges than their non-first generation peers. Large increases in student numbers also mean that at least some institutions of higher learning are becoming less selective, with most growth by far being absorbed in public, and lately, for-profit institutions. Where the better colleges and universities used to accept only the most academically promising high school graduates, many nationally reputable institutions now accept the top fifth, and some large state universities exercise almost no control over student 'quality' as part of their institutional missions. With college now so important for career success and social mobility, a focus on access makes a great deal of sense, but it poses some important challenges for standard teaching methods, especially the large lecture, where student contributions outside of class are so crucial for the success of each individual course session. The data show that time is in short supply and that student motivations may have shifted enough to counsel large-scale changes in pedagogy.

Decreases in academic preparation time likely have much to do with the fact that students are working more than they used to (Perna 2010). The lack of time spent burning the midnight oil is importantly related to the time spent working to pay for tuition. The days of working part time to put one's self through college are largely over because costs have risen so dramatically relative to wages and inflation. NSSE data indicate that about a third of freshmen work twenty or more hours a week off campus. For seniors the rate is nearly two thirds. Drop out, stop out, and poor performance rates have been closely correlated to concerns about available time and money, with students saying that they are trading study time off against work time (Pubic Agenda 2009). The most often cited reason for dropping out, stopping out, and failing out is the relationship between academic time, work time, and available financial resources. This is not a new issue, of course, but cost increases seem to have intensified it, as has the fact that students are now older on average than they have been in past decades, and therefore have a wider range of calls on their time. The National Center for Educational Statistics expects this trend to continue, with the rate of enrollment for students who are over twenty-five more than doubling the rate of enrollment for students who are under twenty-five over the next seven years.

Decreases in student contributions to their educations may also be tied to a larger shift in how they see themselves in relation to college and what they think they are in college to accomplish. In addition to working more, students are also playing more. Indeed, they spend much more time on social and leisure activities than on anything else, as Arum and Roksa (2011) have pointed out. After analyzing time use in 2006 by 6,300 University of California undergraduates, Brint and Cantwell (2010) concluded that "current cultural norms among U.S. undergraduates support a conception of academic studies as an important, but part-time activity." Brint and Cantwell's data—the University of California Undergraduate Experience Survey—reveal that on average, UC students spend about the same amount of time on academic pursuits (28.39 hours per week) as on watching TV, using the internet for fun, and socializing with friends (29.02 hours per week). (Figure 3) Data like these have led Babcock and Marks (2010) to conclude, contrary to some other findings, that that "students do not appear to be studying have reduced study time to work for pay. Students appear to be studying less to have more leisure time." We know students are working more than they used to and we also know that they are studying less. Whatever the motivations, academic time has suffered at the expense of work and play time. Full-time college students have developed, with institutional enabling, a part-time attitude toward their studies. This change likely represents a shift it college *culture.*

More evidence of an important shift in attitudes toward college can be found in what students study and why. The 2011 Cooperative Institutional Research Program's (CIRP) survey of first-year students seems

to reveal that the majority of first-years may primarily see college as a stepping stone to their careers rather than as an opportunity to become cultured and well-rounded thinkers (Pryor et al. 2011). In the 2011 entering class, only 50.3% thought that becoming a more cultured person is a 'very important' reason to go to college, while 85.9%—the top answer—said that getting a better job was a very important reason. Career motivations, of course, have long been near the top of the list of reasons offered by students for going to college, and while the 2011 results flip the answer order of some recent CIRP surveys, they are not very different in degree from the pre-recession 2006 survey in which the top answer was "to learn more about things that interest me." This slight change in response taken together with some other facts, however, might offer reason for pause when we think about pedagogy that relies heavily on unstructured student contributions to class success. This holds especially true for first-generation students, for whom career and financial factors have more weight in decision making compared to their peers.

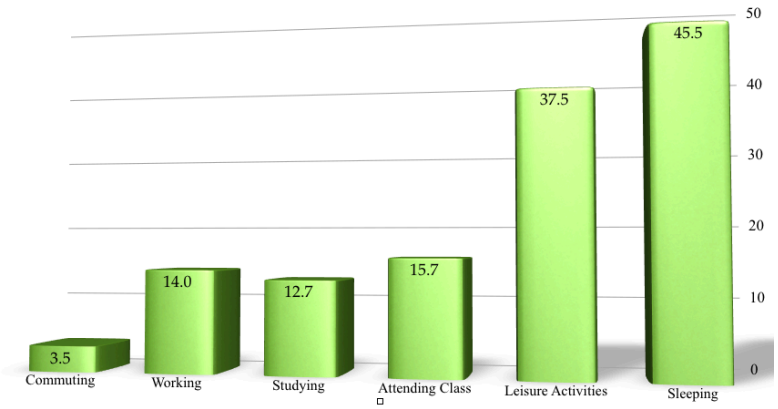

Figure 3. Weekly mean average time use among University of California undergraduates (n = 6300). The leisure activities category includes computer use for fun (11.43), TV watching (5.73), attending entertainment events (3.03), hobbies (5.47), and socializing (11.83), but not volunteering (2.22) or student clubs (3.9). 'Working' here only includes work performed off campus for pay. Data from UCUES as reported by Brint and Cantwell 2010.

Given what freshmen say about why they go to college, it is likely not a coincidence that the number of business majors is rising fast. Business has become what a recent joint article from the *New York Times* and the *Chronicle of Higher Education* called "the default major." Data from the National Center for Education Statistics show that in the 2008–2009 school year 100,000 more business degrees were conferred than in the 1998–1999 school year. A fifth of US undergraduates now major in one of several business disciplines (including finance, marketing, management, accounting, and one or two others depending on the institution). As the *Times/Chronicle* article points out, the National Survey of Student Engagement's 2011 data indicate that business majors study the least compared to other majors. According to Arum and Roksa (2011), business students also perform least well across all majors on the Collegiate Learning Assessment, a standardized test that attempts to measure critical thinking skills.

There is nothing wrong at all, of course, with majoring in business, as many Deans of business schools pointed out at length in response to the *Times/Chronicle* piece. The trend toward the business degree, along with student responses to questions about why they value college, coupled with the push for greater college access, however, may signal an important shift in how students see their college careers and what they want from their time in the academy. It may well be, that is, that the starting point for college students is not where many educators think it is. There is reason to believe that at many colleges and universities, even the better ones, students are not arriving with a thirst for knowledge and with the skills and willingness to take on academic work as it has traditionally been packaged and assigned. In their book-length survey and analysis of the available data on who our students are, Arthur Levine and Diane Dean (2012) conclude that "this is a pragmatic, career-oriented generation...their view of the value of higher education and their goals for college are much more utilitarian than their predecessors of the past four decades..."

Today's students may need to be *inspired* to take up a life of the mind, and this will likely mean that they'll have to be *convinced* of notions that more students in previous generations may have been willing

to take for granted: that knowledge, culture, critical thinking, and reflective judgment are useful, meaningful, and worthwhile skills to develop. It may not be enough to assign reading, present the material in lectures, and then offer 'bubble' tests. Indeed, this may be precisely the wrong way to teach current students because this approach fails to engage them sufficiently. Donald Bligh has offered data suggesting that the standard lecture is probably the least effective way to teach subject matter-related values, inspire interest, stimulate social and personal adjustment, and teach behavioral skills (Bligh 2000). Still, three-quarters of instruction is delivered in lecture format in the US, as measured by student credit hours. In other words, we are doing precisely what will not best accomplish the most important task that falls to 21st century instructors. This is no way to win hearts and minds.

3. Structured Time on Task as a Means to Engagement: A Case

In addition to these considerations of time, money, preparation, and motivation, there is also the simple fact the large lecture is no longer necessary. Technology offers ways to deliver content, meaningfully connect with students, and model rigorous academic discourse without the difficulties and challenges associated with assembling five hundred students and their phones, tablets, and laptops in one room to watch a small figure forty rows away read through his or her PowerPoint slides for an hour. Technology can make learning at a distance more personal than the relationship between students and instructors in many lecture theaters.

The question of what to replace the lecture with, however, is a difficult one. Technology isn't the answer; it's just a tool. If we are going to replace current practices with those that will do a better job of driving student engagement and lead to better outcomes, a serious conversation about time, space, and labor resources will be necessary. Which lessons and skills are best delivered in a face-to-face environment? Which lessons and skills are best learned from face-to-face interactions structured by content delivered online and exercises done in class, as in the 'flipped' classroom model? What are best practices and defensible pedagogies for courses delivered in hybrid or online formats? How can we best use all of these formats and their associated tools to do a better job of building student cohorts, of drawing students into university life, and of teaching high-level intellectual skills? Also—and it's hard to overestimate the importance of this consideration—the act of coming to campus and being part of a community of learners can make the critical difference for many students. The lecture is much more than information delivery; it is also an occasion to have one's non-academic life interrupted by university life and its values. How much of the social and group-switching aspects of lecture can be served by technology remains to be seen, but it will pay to be mindful of what draws students in and motivates them to succeed.

While these larger questions require larger discussions, we can move toward better practices now by realizing that instructors will have to structure students' time in new and innovative ways. That is, instead of getting rid of the lecture, instructors can change the learning context in which the lectures are delivered. They can push students not only to spend more time, but to use study time in better ways.

After noticing that students were not buying, much less reading, the textbooks for my large introductory biology course at Arizona State, my co-instructor and I decided instead to assign one 'interesting' reading for each lecture. These were sometimes explorations of biological systems or accounts of scientific discoveries from various sources on the web, and sometimes were discussions of controversial topics in biology from the NIH or the *New Yorker*. The idea was that the students would become interested in a controversy, new discovery, case study, or ethical dilemma and thereby be motivated to learn the biology as well as reflect on what the science means for them.

Over two semesters, average student on-time access of the documents was 27%, even when students were told that the instructors could see whether and when they downloaded the materials and even when clicker quizzes were frequently administered. That is, better than two thirds of the students did not access the assigned reading before class, which matches the national trends fairly well. NSSE data indicate that almost 80% of freshmen report having gone to class without doing the readings. The same data also indicate that upperclassmen are less conscientious about completing out-of-class assignments than

freshmen: in the 2011 NSSE report, ~85% of seniors said that they often or very often go to class without having completed the assignments.

In revising my course, I made two critical mistakes. First, for many students, an article from a weekly literary and news magazine is *exactly* as tedious and boring as a textbook chapter. Second—and this consideration is related—asking students to be active in their learning without providing a mechanism for doing so ignores everything in the last two sections of this essay about who is in college, why they're there, and what they hope to get from it. I asked a class that was three fourths underclassmen in which business, education, psychology, and art majors were heavily represented to get so worked up about what the National Institutes for Health had to say about the debate over human embryonic stem cell research that they would want to learn about meiosis. They didn't.

As a next step, I combined the 'interesting' course-reading idea with the idea that structured time on task is better time on task. Working with a publishing company (SimBio) that had developed a set of virtual labs for high school and college biology courses, I worked up a set of homework assignments by adapting the existing labs. Instead of giving up on the lecture, I structured students' contribution to their own learning by associating particular readings with each lecture period, associating an online 'lab' exercise with each piece of reading as homework, and then giving the homework portion of the course substantial weight as a proportion of the final grade. The readings and homework were delivered using Kno, an education-specific e-reader. Kno has a set of 'smart link' features that instructors can use to mark up documents for students and to embed notes, questions, and hyperlinks in the text or margins. I used these features to send students from the reading to auto-graded homework assignments engineered to ask them to apply what they had just read to new situations.

Figure 4: Screenshot from SimBio. After reading about speciation in Galapagos finches, students were asked about environmental scenarios different than those described in the text and graded on their ability to predict the evolutionary outcomes in a virtual environment they could manipulate.

For instance, after reading a few paragraphs from a primary source about variations over time in beak depth in Galapagos finches, students were asked to access a model finch population to see if they could demonstrate understanding of biological fitness and differential reproduction by correctly predicting outcomes for beak depth in evolutionary situations that were slightly different than the one they had just read about. SimBio can output student answers to the homework questions as CSV files (Figure 4). In a summer session pilot group, 85% of students accessed exercise-associated readings on time, and the median test score for associated test questions rose by nine percentage points.[2] The tests used in the summer course were virtually identical to the tests in the previous version of the course.

[2] This increase in scores may also have been due to a substantial decrease in class size, or to the compressed schedule of the summer term. Much more study is needed. There is, however, reason to believe that results like these are robust. In this connection see the longer-term and much better controlled study on structured and active learning in introductory biology that was conducted by David Haack and colleagues (2011) at the University of Washington.

It's possible to do still more with the structured time on task idea. In the class meeting after students completed their homework on evolution, I asked them to work in groups to construct scenarios in which beak depth would assume a bimodal distribution. There are several ways to achieve this outcome in the time allotted, but to specify one of them, students would have had to do the reading and have experience in manipulating the model. That is, they needed to understand the ideas already and to know how to do something with those ideas.

It is surely not radical or groundbreaking to associate a homework assignment with reading to drive student engagement and task completion. Indeed, this is probably the second oldest way of keeping students honest. What's new here is that this solution is a *scalable*, cost effective way to ask students to learn from the reading then apply their knowledge in new situations presented to them in an online environment. It's a way to force critical engagement with the material in something other than a small recitation or seminar section. It's also a way to ask students to do more difficult work and then to support them as they do it; those who are willing to invest the time often don't know how to work on the material.

The structured time-on-task approach may, in the end, not improve student performance, even though most students in the pilot course reported that they preferred structured assignments to those offered in the standard way and said that they learned more. It does, however, face the challenges of teaching students in large lecture courses and tries to make lecture time much more productive.

4. The Lectureless Class?

The structured time-on-task approach is an attempt to retain the lecture but improve its effectiveness by changing its learning context. The idea is to improve students' contributions to their own learning, but much more can be done. Even though I think there are ways to make the lecture better, these in the end may amount to offering the best version of a bad practice. Lectures generally, don't after all, lead to discussions outside of class (Nathan 2005), and usually not in class either.

What, then, ought we to do? Detailed answers to this question depend, of course, on what particular institutions are trying to accomplish, but some general answers are available. First, we should do a much better job of knowing who our students are and how they learn. Second, most institutions would probably do well to begin a transition away from large lecture courses and toward something that more effectively engages students and structures their contributions to learning. Third, faculty must be apprised of what they are up against, and then strongly supported as they move on to whatever is next in course delivery. Faculty attempts at innovation must be rewarded, failure must be embraced as the cost of creative solutions, and successes must be used as templates for expansion of particular models. We also need to rethink our physical spaces and classroom-planning processes to make them more responsive to changes in pedagogy. Finally, we need to ask a lot more of our students. This means giving them more, too.

With current trends pointing to decreased quality and increased costs even as higher education becomes more important than ever for social and economic standing, it is time to have a serious conversation about teaching and learning practices. High DWIF courses are a natural place to start, but if student motivations and demands have shifted as much as it appears, the education establishment should be open to broader changes as well. In particular, does it make sense to promote, tenure, and retain faculty without any serious attention to either the quantity or quality of their teaching, as is the case at most research institutions?[3] Also, does a curriculum largely built around a dichotomy between academic disciplines and general education requirements still send the right message to students? Given who now goes to college, should more professionally focused degrees be offered, especially if these can be used to motivate student

[3] This sounds more radical than it really is, as 97.7% of faculty surveyed by the Higher Education Research Institute rated their teaching role as either "very important" or "essential" to them personally, while only 71.4% said the same thing of research. Faculty at all types of institutions also chose the promotion of intellectual development of students as the highest institutional priority (from a list of nineteen possibilities) where they work.

interest in the liberal arts? Or perhaps less fragmentation is better, and what makes sense is the de-disciplinization of learning in favor of a challenges-based approach?

Educators can do a lot of good by reforming, rethinking, and reinventing the large lecture course in the light of who the students are and what is possible using technology, and I have argued that they should. If current trends in higher education continue, it will become even more critical that instructors find new ways of teaching, that they are shared effectively, and that faculty are supported and rewarded for adopting them. In the medium- to long-term, however, the question of which solutions to embrace will best be answered in the larger context of a discussion of what a high-quality 21st century education should be, what is scalable to meet the needs of students and society, and where our state and national funding priorities should be with respect to education.

Figure 5: The active learning classroom in the School of Life Sciences at Arizona State, which seats ninety-six students in six-person groups. Similar spaces are under construction at the University of Houston.

Over the coming year a team from the University of Houston and two Arizona State campuses will build on the structured time on task idea and offer a 'flipped' version of their introductory biology course. This is to largely give up on the lecture and partly to replace it with activities of the sort described above. Students will spend at least one 'lecture' period each week working on tasks that are only accomplishable if they understand the concepts discussed in the readings and in short video presentations offered online. This practice is enabled by spaces that are conducive to group work (Figure 5), the production of high quality online content, and a TA staff that has been trained as facilitators rather than primarily as recitation section leaders. Not only will student reading time be structured, but so will some of their class time. The idea is that through this introductory course, students will learn the very thing that they most need to know and that there are now not taught. They will learn to structure their own time on task.

The response to declining student preparation has generally been to complain about the quality of the students. After all, better than 90% of college professors think that they are above average (Cross 1977; Blackburn et al. 1980). Given the data, my sense is that most students in large, lecture-based courses aren't motivated by what they're given and don't know how to learn in that environment. Why would they? How would they? No one never taught them.

It is not an overstatement to say that the fate of higher education in the United States depends on whether we insist on teaching the students we were, or find ways to teach the students we have.

References

Arum, R., and Roksa, R. (2011). *Academically Adrift*. Chicago: Chicago University Press.

Babcock, P. and Marks, M. (2010). Leisure college, USA: the decline in student study time. *AEI Outlook*, 7.

——. (2011). The falling time cost of college: evidence from a half century of time use data. *The Review of Economics and Statistics*, 93, 468–478.

Blackburn, R.T., Bober, A., O'Donnell, C., and Pellino, G. (1980). *Project for Faculty Development Program Education: Final Report*. Ann Arbor, Ml: University of Michigan, Center for the Study of Higher Education.

Bligh, D. (2000). *What's the Use of Lectures?* New York: Jossey-Bass.

Bloom, B. S. (1984). *The 2 sigma problem: The search for methods of group instruction as effective as one-to-one tutoring. Educational Researcher*, 13, 4–16.

Brint, S. and Cantwell, A. (2010). Undergraduate time use and academic outcomes: Results from the University of California Undergraduate Experience Survey 2006. *Teacher's College Record*, 112, 2441—2470.

Cross, K. P. (1977). "Not can, but will college teaching be improved?" *New Directions for Higher Education*, 17, 1–15.

Dale, E. (1969). *Audiovisual Methods in Teaching*. New York: Dryden Press.

Elman, C., and O'Rand, A. M. (2004). The race is to the swift: Socioeconomic origins, adult education, and wage attainment. *American Journal of Sociology*, 110, 123–160.

Guskey, T. R. (2001). Mastery learning. In N. J. Smelser and P. B. Baltes (eds.), *International Encyclopedia of Social and Behavioral Sciences*. Oxford: Elsevier Science Ltd, 9373–9377.

Haak, D. C., HilleRisLambers, J., Pitre, E., and Freeman, S. Increased structure and active learning reduce the achievement gap in biology. *Science*, 332, 1213–1216.

Kulik, C., Kulik, J., and Bangert-Drowns, R. (1990). Effectiveness of mastery learning programs: A meta-analysis. *Review of Educational Research*, 60, 265–306.

Levine, A. and Dean, D. (2012). *Generation on a Tightrope: A Portrait of Today's College Student.* San Francisco: John Wiley & Sons.

Nathan, R. (2005). *My Freshman Year*. Ithaca: Cornell University Press.

Ng, T. W. H., Eby, L. T., Sorensen, K. L., and Feldman, D. C. (2005). Predictors of objective and subjective career success. A meta-analysis. *Personnel Psychology*, 58, 367–408.

Perna, W. (2010). Understanding the working student. *Academe Online*, July-August.

Pryor, J. H., DeAngelo, L. Blake, L. P. Hurtado, S., and Tran, S. (2011). *The American Freshman: National Norms Fall 2011*. Los Angeles: Higher Education Research Institute.

Robinson, S. L., Sterling, H. E., Skinner, C. H, and Robinson, D. H. (1997). Effects of lecture rates on students' comprehension and ratings of topic importance. *Contemporary Educational Psychology*, 22, 260–267.

Rojstaczer, S. and Healy, C. (2010). Grading in American colleges and universities. *Teacher's College Record*, March 4.

Ryan, C. and Siebens, J. 2012. Educational Attainment in the United States: 2009. United States Census Bureau.