

Redesigning a Large Macro Principles Course Using Bain's *What the Best College Teachers Do*

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Abstract

This paper describes the careful analysis by [Bain \(2004\)](#) of 63 of the “best” instructors he found in more than 15 years of searching U.S. and Australian colleges and universities. They taught at every conceivable institution: from medical schools to junior colleges. Surprisingly, there was very little emphasis on techniques, but considerable use of research from cognitive scientists on how learning occurred. Many of these best instructors had not read the research but essentially stumbled upon their results. Bain's findings are remarkably consistent with the latest research in physics education ([Wieman, 2007](#)). Both go considerably beyond current practice in economic education. Many of Bain's findings were implemented in a large macro principles course in the Spring of 2007 and the results are discussed here. Further concepts will be implemented in the Spring of 2008. These include identifying and acting on student misconceptions.

1 Introduction

This paper describes how I attempted to implement principles of *What the Best College Teachers Do* ([Bain, 2004](#))* in a 300-student macro principles class at SUNY Oswego in the Spring of 2007. Bain visited the SUNY Oswego campus for a talk to a large group of faculty, and for a small workshop, in the Fall of 2006. I found both he and his work to be engaging and engrossing. The effort that went into his study is impressive: for 15 years he and his colleagues searched for the

*If you are reading this electronically, you should be able to click on citations and be taken to the bibliography. At the end of each entry there, you will find the page number. It can be clicked on to return to the text. Many of the references include clickable URLs. Footnotes and references to sections are also clickable.

“best” college instructors and then studied in-depth the 63 they found to find common approaches. He brought to focus half-formed ideas that had been fermenting in my mind. In other cases, he challenged my views in ways that brought greater understanding to my teaching. Another appealing feature was that his work often drew on the latest findings by cognitive scientists in learning theory. Most remarkably, the book is surprisingly free of teaching techniques as he places secondary emphasis on them. For many years I had tried one technique after another in this class and I was consistently disappointed with continued low levels of student learning. I was coming to the conclusion that my effort was substituting for my students’ and that I needed to find some way to engage them with the material to break this transfer of effort and to help them better learn the material. Like Bill Wood of James Madison University, I feel that my students have a “high elasticity of offsetting behavior” (Wood, 2007). More formally, Allgood (2001) and Becker (1982) presented formal models that argued that in the face of teaching innovations students may use them not to further their mastery of the subject but instead to reduce their time on task. Bain’s holistic approach to college teaching appears to offer a way to engage students so that they increase their efforts and undertake deep learning. Besides these factors, and on a personal note, I have been teaching for two decades and it was exciting to see a different approach to something that was in danger of becoming stale.

Originally I planned to redesign this course over my Fall of 2007 sabbatical, but ultimately I found the ideas so captivating that I spent much of the Spring of 2007 implementing some of Bain’s principles. This may not have been wise from a time-management standpoint given the effort involved, but I was determined to improve the course as quickly as possible. I did not want to spend the semester wondering what I could have done and perhaps cheating students out of a better course. Also, during the Spring of 2007 my colleagues and I began carefully evaluating the work of the *National Center for Academic Transformation* (NCAT) and the related *Redesign Alliance*. John Kane and I attended their first annual conference that Spring. NCAT argues that it is possible and indeed desirable to redesign college courses that, through the use of technology, are lower in cost and increase learning. Given the productivity improvements throughout almost all economy, this seems at least superficially plausible. NCAT has numerous examples of redesigned courses where students learned more and costs fell. However, virtually none of their examples were in economics. My department currently has a proposal to redesign our macro and micro principles under SUNY auspices and this work is part of that.

To put this project into perspective, it likely helps to describe SUNY Oswego and our students. In the oft-derided but commonly quoted college guide from *U.S. News and World Report* (2008 edition), Oswego ranks 85th among masters institutions in the Northeast. According to that issue, it has a 50% acceptance rate, the 25%—75% SAT/ACT percentile is 1040-1190*, and 50% of freshman were in the top 25% of their high school class. Although the macro TUCE had not been given in the department in some years, the micro was last given in 2003 across four sections. The pre-test score came in at the 25th percentile and the post-test at the 35th percentile.

*Oddly, it said, “Data not submitted in the form requested by U.S. News.”

2 Bain's Findings

Ken Bain has a long history of leadership in the scholarship of teaching at the university level. He founded teaching centers at Vanderbilt, Northwestern, and NYU, respectively. When he started at Vanderbilt in 1986, he began this study of finding the “best” college teachers. They took “nominees” from every possible quarter: faculty, students, listservs, announcements at conferences, and lists of teaching award winners. Very high student evaluations were a necessity, but other evidence was required to show “the professor regularly fostered exceptional learning” (Bain, p. 183). These varied by discipline, but included department finals, national board exams, student interviews, and observations. In sum, “We wanted to know that the teacher was successful in reaching most, if not all, the students, and in helping an unusually high number of them achieve what we could regard as exceptionally advanced levels of learning” (Bain, p. 183). He called this “deep learning” that went far beyond merely doing well in the course. Bain and his colleagues had difficulty defining this but eventually came to

The closest we came was in terms of intellectual and personal development. In general, we thought of intellectual development as understanding a sizeable body of material, learning how to learn (to expanding understanding), to reason from evidence, to employ various abstract concepts, to engage in conversations about that thinking (including the capacity to write about it), to ask sophisticated questions, and the habits of mind to employ all those abilities. Personal development meant understand one's self (one's history, emotions, abilities, insights, limitations, prejudices, assumptions, and even senses) and what it means to be human; the development of a sense of responsibility to one's self and others (including moral development); the capacity to exercise compassion; and the ability to understand one's emotions. It also meant the emergence of the habits of the heart to maintain and employ these developments (Bain, p. 189-90).

Students of these instructors put it in other ways: “you'll learn more from her class than from any other at this school;” “this class changed my life” (Bain, p. 6), the course “changed everything;” “I thought it was all cut and dried before I took this course. It's pretty exciting stuff;” and “He didn't just show us how to solve the problem but helped us think about it so we could do it on our own. I can think through problems better now.” (Bain, p. 11-12)

Over some 15 years Bain and his colleagues identified 63 instructors that met this criteria and 35 were studied intensively. They taught in 40 disciplines and in institutions; these included top medical schools, elite undergraduate institutions, open admission colleges, and junior colleges. This suggested “that to us that some fundamental principles prevailed and worked well regardless of the academic qualifications of the students” (Bain, p. 188).

It is difficult to imagine how one might quantify the learning results these instructors have produced given their multiplicity of disciplines and institutions. Thus, it was entirely descriptive. The study was also consistent with Bain's approach as a historian (he is completing his third book on U.S. Middle Eastern policy). Bain's approach to the study was a bit jarring, however, as it was data-free.

Clearly, only the barest glimpse of his findings can be described on a few pages here, but hopefully, a sufficient sense of it can be given. First, he found that these instructors generally had a strong intuitive understanding of human learning. Often this mirrored the latest findings by learning researchers, but only some had read that research. The instructors understood that “knowledge is constructed, not received” by a student. That is, minds are not empty containers that instructors fill, but places where people construct an understanding of a subject. Students come to class with models of the subject at hand, and these models change slowly. The classic reference is [Halloun and Hestenes \(1985\)](#) from physics. They found that a class in introductory physics only leads to minor changes in students’ view of the motion of objects, the focus of the course. That is, their model of motion was barely changed in spite of taking a rigorous college course in the subject. Later, [Walstad and Allgood \(1999\)](#) found roughly the same in our field—an economics course or courses had little impact on later knowledge of the field’s tenets or fundamentals. The best instructors understood these failings and set up systems where students could confront the models they brought to class, find them untenable, and then be brought to deeply understand the course content. Questions posed by the instructor also played a key role in helping their students learn. These points, paired with the instructors’ strong understanding of their field’s histories and controversies, were used to guide students in their difficult construction of knowledge.

Next, the instructors grasped the distinction between intrinsic and extrinsic rewards and how they applied to the classroom.* In the lab, learning theorists have found that adding extrinsic motivation reduces one’s intrinsic motivation for a task. Of course, college is full of extrinsic motivations—grades, assignments, and due dates are just a few. There should be little surprise that many students are “strategic learners” who merely learn enough to get the desired grade. These instructors used a variety of methods to make their courses intrinsically interesting and they simultaneously downplayed if not eliminated extrinsic motivation. These instructors often used the following techniques:

- cooperation and collaboration took place between students and also with the instructor
- grades were downplayed
- each exam was comprehensive so that students could try repeatedly
- the syllabus was marked by promises, not demands
- at the start of the course, students were invited to participate in a search for the beauty of the subject.

In a very real sense, students were given a sense of control.

While it is not clear if the instructors were aware of it, Bain goes on to describe the deleterious effects of “person-praise” over “task-praise.” In grade school, a parent might tell their child that “they’re smart” when they do well, and in the other case a parent might tell their child “you did well in that class.” Person-praise tends to lead to a “fixed-mindset” where the student believes that one’s abilities are largely fixed. Students are often less resilient and show less persistence in their studies. After all, if intelligence is fixed, what is the value of perseverance? Students also shunned activities that might show that they were not “smart,” such as challenging classes. In a paper that

*The former motivation comes from within a person and the latter from outside.

came out after Bain's book, (Blackwell et al., 2007), research found that by changing students' mindset from a fixed to a flexible one, they learned more.

In addition, these instructors clearly had a strong sense of the different types of learners. Following Perry (1998), Bain labeled the types of learners as follows:

- "received knowers" who believe in "right" answers and memorize
- "subjective knowers" who think all is an opinion
- "procedural knowers" who can "play the game of the discipline" but have not internalized its approaches
- "commitment knowers" who are independent, critical thinkers (Bain, p. 42-44).

Bain makes a very strong case that much more than native ability determines classroom success. His instructors clearly had an intuitive sense that seemingly subtle factors influence learning. For instance, the concept of "stereotype threat" shows that the merest suggestion that one group performs worse than another group on a given type of exam can lead to lower exam results. Taken together, Bain found that the best instructors typically did the following:

- wrote "authentic" and intriguing assignments that developed their students' skills
- challenged their students' models
- assessed their own teaching efforts and worked relentlessly to improve them
- let the student try, fail, and try again in a "safe" environment.

The last point might be related to the "testing effect," which Bain does not mention. Briefly, simply asking about material reinforces one's memory (Roediger and Karpicke, 2006). Karpicke explained, "The testing effect cuts against the lay understanding of memory. People usually imagine memory as a storage space, as a space where we put things, as if they were books in a library. But the act of retrieval is not neutral. It affects the system" (Glenn, 2007). Once again, it seems that Bain's subjects have had their methods confirmed by cognitive science.

When these instructors prepare to teach, they very much view their job as facilitating learning as opposed to the more common "transmission" view of teaching, where the expert instructor imparts wisdom to her students. Given the prevalence of lecturing in economics, one would suspect that most economists adhere to the transmission model. Instead, Bain would seem to follow the words of Saunders (1997, p.91): "It's not what you cover, it's what they learn." Bain's instructors worked to aid students in assimilating the material and thus deeply learning it. They were also unusually thorough in planning not only course topics and the skills that students needed to develop; as well as assisting students who faced difficulty, and assessing their students and themselves.

These instructors were quite demanding of their students, but not in a fashion that "piles on the work" which can alienate students. The instructors also placed great faith in students' ability to achieve, but instead of just staying this, the instructors made it clear in their assessments. For example, when marking a paper they might say that with these revisions "you will have an excellent paper." They also felt that each student could make an individual contribution and they left students in control of their learning. Some promoted this with a "promise syllabus." Rather than demands, it offered promises of what the student could achieve if they committed themselves to the course. Such a syllabus avoids the language of requirements and demands.

In the classroom, Bain did not focus on techniques but on broad principles. He argues that

the method matters far less than do the challenge and permission for students to tackle authentic and intriguing questions and tasks, to make decisions, to defend their choices, to come up short, to receive feedback on their efforts, and to try again (Bain, p. 100).

Many instructors implement these principles into five elements:

- First, an “intriguing question” is posed
- Second, students are helped to understand its significance
- Third, students are engaged in higher-order thinking—more than listen and remember
- Fourth, the student is helped to answer the question
- Finally, students are left with another question

Some instructors almost entirely used lectures for their class and incorporated these points, but others lectured little. All, however, did hold their students’ attention for the entire class. Every ten to twelve minutes the class would change its focus or pace (even for those who primarily lectured). Many had worked on enunciation, and rather than putting on a performance, they talked as if they were engaged in a conversation.* Their explanations often started with a very general and perhaps not very accurate depiction and then they narrowed the scope to a more accurate description as students understood the broad picture. Class topics were often not focused on what the discipline mandated “must be covered” but rather started with the knowledge that students brought to the class, and then moved that to the discipline’s framework. These instructors also engaged their students in the analysis methods employed in their discipline.

In treating their students, Bain found these teachers were remarkably humble and frequently made reference to the difficult time they had learning the material. Bain quotes Chemistry Nobel Laureate Dudley Herschbach (of Harvard) as saying, “You have to be confused before you reach a new level of understanding” (Bain, p. 143). Rather than displaying an ego, these instructors instead displayed a remarkable concern and indeed kinship with their students in a mutual path of learning. They cared much more about learning than their students’ exam scores. Bain tells a charming story about one student who came to see his math professor before the common department final. The student had failed every exam and was quite worried about the final. The professor began to question the student and slowly merged into deep questions. In nearly two hours, the professor determined that the student indeed had reasonable mastery of the material; it seemed that the he had severe test anxiety. At the end of the meeting, the professor told the student that he had taken an oral exam and passed the course. When asked about the final, the professor suggested that he “take it just for grins.” The student scored a B+ (Bain, p. 135-6). Nonetheless, instructors expected their students to engage the material and many explicitly said so. They trusted their students would do so until proven otherwise. This trust was found at all types of institutions. Bain and his colleagues also “encountered less effective teachers everywhere who were convinced that the gods of academia had stuffed their classes with nothing but lazy anti-intellectuals” (Bain, p. 141). John Lachs of Vanderbilt had an interesting riposte: “When my teaching fails it is because of something I have failed to do” (Bain, p. 145).

*In the talks he gave here, he indeed did exactly this. In recalling his talk and workshop, I was struck by how personable and engaging he was in front of a group; much of it was exactly this “technique.”

Instructors saw student assessment as an integral part of their course and they designed their courses to include the skills that they wanted their students to acquire. Instructors often described the skills needed to achieve a certain grade on an exam. They often gave comprehensive exams so that students would have more than one try with the same material and so that students could learn from previous attempts. Rather than seeing grades as an end to themselves, these instructors saw grades as a way to communicate with their students about the progress of their learning. The communication was not about their acquisition of knowledge but their intellectual development. Instructors also worked with their students to assess student learning as part of their intellectual development.

Many instructors also used student evaluations during the semester. Some would do so three or four weeks into the course and others would bring in outside evaluators to talk to students in small groups. Overall, they took their teaching as a serious academic endeavour.

Bain concludes his book by contrasting the often-used transmission model of teaching to the one employed by the participants in his study: “teaching only occurs when learning takes place” (Bain, p. 171). Rather than telling, teaching is about creating an environment that fosters learning. He claims that the biggest impediment to excellent teaching is the view, baldly put, that, “teaching ability is implanted at birth” (Bain, p. 173). While not mentioned by Bain, Ericsson et al. (1993) started a vast literature that found just this in numerous fields. As Ericsson and others put it, “Individual differences, even among elite performers, are closely related to assessed amounts of deliberate practice. Many characteristics once believed to reflect innate talent are actually the result of intense practice extended for a minimum of 10 years.” Bain’s participants learned how to reach their students through careful analysis and they approached it as they did their scholarship. Bain goes on to say it is foolish to ignore the learning literature and adds, “We wouldn’t tolerate it if our students announced that they planned to stop studying in our disciplines and to draw all their conclusions from intuition and whim” (Bain, p. 176). In his view, the second biggest impediment to better teaching “is the simplistic notion that good teaching is just a matter of technique.” (Bain, p. 174). Instead, instructors must be able to create workable learning environments for their students.

Several thoughts come to mind before using other research in this area to evaluate Bain. First, while he does not say so explicitly, one suspects that his findings are synergistic. Just applying one or two of his findings may not lead to greater student learning. Second, these findings would seem to have implications for those writing software for our students. Many packages have a dozen or two questions per chapter; Bain would likely argue that many more questions are needed to develop a deep understanding as internal models are resistant to change and it takes repeated rounds of trying, receiving feedback, and trying again to achieve deep learning. He might also argue that immediate feedback with context-sensitive corrections would be useful. Currently, the format of many questions seems to mirror pencil-and-paper multiple choice exams and do not fully exploit computer technology. Further afield, one could imagine software that asks appropriate questions based on a student’s understanding. Many of these features are in software used in other fields, such as math.

Before describing how Bain’s findings were implemented, it seems sensible to compare his findings to others. One is Wieman (2007), a leader in physics education. In recent years physicists

have spent considerable time learning how their students learn (or not), and that discipline's technical demands are closer to economics than many others. Unlike Bain, this research is quantitative and the results are empirically based. Wieman carries considerable stature in his field; one could argue he has about as much as do George Akerlof, Michael Spence, or Joseph Stiglitz have in ours: he too received a Nobel Prize in 2002. It is very well-worth noting that [Maier and Simkins \(2006\)](#) make many of the same points.

Clearly the title of [Wieman \(2007\)](#), "Why Not Try a Scientific Approach to Science Education?," is nearly identical with what Bain sees as the largest impediment to excellent teaching—it must be analyzed much like the other scholarship we carry out. He puts it this way: "Taking a more scholarly approach to education—that is, utilizing research on how the brain learns, carrying out careful research on what students are learning, and adjusting our instructional practices accordingly—has great promise" ([Wieman](#), p. 15). Citing research in his field, Wieman wholeheartedly agrees with Bain's point that the transmission model is a singularly poor way to teach. He challenges readers with a "strong stomach" to ask students after a lecture what the major points were. Also like Bain he argues that instructors must be aware of models that students bring to class and that students' use of the discipline's tools fall into different categories, along the lines of Perry's "received knowers" to "commitment knowers." In words very similar to Bain's, Wieman argues that "People learn by creating their own understanding," and "Effective teaching facilitates that creation by getting students engaged in thinking deeply about the subject at an appropriate level and then monitoring that thinking and guiding it to be more expert-like" ([Wieman](#), p. 12). While not mirroring Bain's use of questions to engage students, he proffers addressing "why this topic is worth learning, how it operates in the real world, why it makes sense, and how it connects to things the student already knows" ([Wieman](#), p. 13). Wieman too argues for carefully crafted homework exercises; in his terminology "Extended, highly focused mental processing is required to build those little proteins that make up the long-term memory. No matter what happens in the relatively brief period students spend in the classroom, there is not enough time to develop the long-term memory structures required for subject mastery" ([Wieman](#), p. 13). Unlike Bain, he offers specific techniques: "Just in Time Teaching," where students receive questions just before class and their understanding is used to drive the class; carefully designed on-line simulations; and the use of clickers in a very focused way. While Bain rarely mentioned techniques, he did argue that the best instructors changed pace every ten to twelve minutes, which is consistent with Wieman's use of seven to ten clicker questions per class. This would seem to be a subset of Wieman's argument that the "cognitive load" be reduced in class to deal with humans' small short-term memory.

There are two primary categories of Bain's findings Wieman does not mention: intrinsic and extrinsic motivation and the related downplaying of grades, the "promise syllabus," and the sense of a joint mission between instructor and student; and the influence of seemingly subtle factors in learning like stereotype threat and a fixed or flexible mindset. These aside, the commonalities between Bain and Wieman are striking and indeed even eerie even given the joint reliance on learning theory. As my colleague John Kane observed, it is gratifying that the research appears to be converging.

3 Implementing Bain's Findings

Many of Bain's findings were implemented in my Spring 2007 macroeconomics course. To ensure that students who only take this course have some grounding in micro, the course also covers markets. It had an enrollment of approximately 300. For technology in the classroom, each student had a "clicker" (InterWrite PRS model)* It is something like a TV remote control, and with software and a receiver that PRS provides, I could ask questions and get an individual response from each student. Results from the entire class could be displayed with a projector. Outside of the classroom the open source "Moodle" course management software was employed; it was installed on my office PC. I could have used the campus course management software (CMS), which was then a SUNY home-grown one based on Lotus Notes, but as it was subject to numerous complaints and had many limitations, it seemed best to use higher quality software. Moodle has roughly the same features as Blackboard or WebCT. Course materials (primarily readings and notes after that class) and quizzes were placed on it.

The first change was the syllabus (see the *Syllabus* Section). It eschewed demands and requirements and instead focused on promises. Note how "welcoming" the introduction was worded. Also note now grades were distinctly downplayed in the section that described their calculation. To complete the idea of being promising, I also made an explicit invitation the first day of class and for them to join me to study this difficult but rewarding material.

As a quick check of the syllabus shows, I also implemented cumulative exams (there was a final and two class-length exams during the semester). While the wording was a bit off, the concept was that if a student performed better on the second exam it replaced the first exam score, and if they did better on the final then it replaced the first and second exams (i.e. the final then became 100%). About a third of the content of the second exam was from first exam material while the questions on the final were evenly distributed from across the course.

The order of course topics was completely reorganized (please see the *Outline* Section). While the traditional topics were "covered" this organization placed them in a series of questions and sub-questions to help engage students.† Coverage was a bit limited due to two factors. The first was that we lost a week of class due to snow (Fernandez and Staba, 2006). While it snows quite a bit in Oswego, we received nearly a year's worth in a week. It is difficult to hold class when roads are closed. Second, in retrospect, too much time was spent on economic growth at the start of the semester. The overall question for the course was "Why do economies grow (or not)?" and from that subquestions branched off to cover specifics. I also placed needed "tools" near questions that required them for answers. For example, GDP was covered after describing growth in general terms and then we went back to look at growth in terms of real per capita GDP. In short, the applications and the tools were more closely integrated than usual. Markets were motivated by how they aided growth, recessions were first described, then defined, and then we explored what might be done about them. From there we took a tour of fiscal and monetary policy. This might more closely follow Wieman's point of addressing "why this topic is worth learning, how it

*Clickers come in both radio frequency ("RF") and infrared versions. In general, the former are preferable as they have greater range and they do not have to be pointed toward the receiver.

†When writing this paper, I noticed that I inadvertently did not ask questions in the last part of the course.

operates in the real world, why it makes sense, and how it connects to things the student already knows.”

Clickers were used in class, usually once or twice a day, to query students on the topics of the day. Upon reflection, the quizzes were on the perfunctory side and most definitely not what Wieman would advocate.

The final modification to this course from Bain was dealt with student misconceptions. Give their very nature, student misconceptions are hard to identify: I have collected these over the years from surveys I have given and from readings. Here are the major ones I asked the class about and then tried to lead them to the “correct” view.

1. the government controls a significant number of consumer prices (from previous surveys I have done)
2. the unemployment rate is much higher than the actual rate (since seen in [Blendon et al. \(1997\)](#))
3. many workers earn the minimum wage and its value has an important macro impact (previous class surveys, anecdotes, and news reports)
4. 9/11 caused the 2001 recession (anecdotes and news reports)
5. the President has great influence over the economy (anecdotes and news reports)
6. real incomes have little changed in decades (from [Easterbrook \(2004\)](#) and later seen in [Blendon et al. \(1997\)](#))

The results of a clicker survey for #1 are in Figure 1. The very wide dispersion and the high values came as something of a surprise and I was not entirely sure how to deal with it. I ultimately just stated that the government actually controls very few prices but undoubtedly that was not very effective. For #2 I surveyed the class on their and their family’s situation. Also, I suspect that this misconception is tied to low or negative employment growth as in [Blendon et al. \(1997\)](#). To deal with

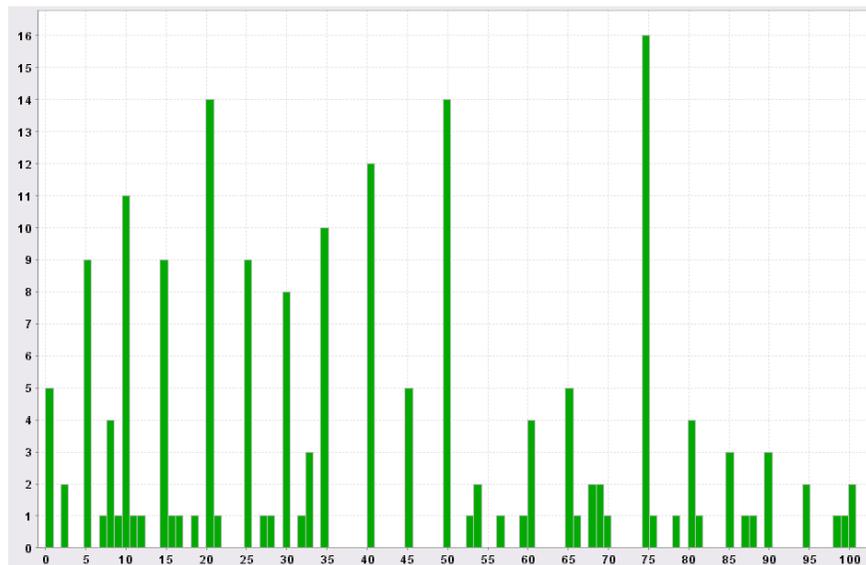


Figure 1: “Of the prices of goods and services that you buy, what percent are set or controlled by the government?”

that misconception, one could imagine watching an animation of suburban sprawl (well-known, at least outside Upstate New York) and ask what happened to the number of jobs. For #3 I showed them the national median home price and those in some markets across the state. We then we visited a mortgage calculator to check the payments. Some students indeed looked startled. For #4

I talked about the NBER list of peaks and troughs. For #5 I assigned [Krauthammer \(2004\)](#). For #6 I assigned the survey shown in the *Clicker Exercise on Economic Growth* Section. The most common comparison decade was the 1940s. The most compelling data was for cars and travel. In the 1940s 78% of respondents had 0 or 1 car, today 72% have 3. In the 1940s, 65% had been to less than four states, today 76% had been to more than six. From there, I described the importance of small differences in growth rates over long periods.

In several cases I used clickers not to address misconceptions but to introduce ideas. Here are several examples:

1. Should we, in the U.S. make rubber ducks?
2. Who are the world's biggest and second biggest exporters?
 - (a) China, Germany
 - (b) Germany, U.S.
 - (c) U.S., China
3. Who is the world's biggest manufacturer?
 - (a) Germany
 - (b) Japan
 - (c) U.S.
 - (d) China

Question #1 leads into the perennially difficult comparative advantage. Question #2 emphasizes trade from an easier to understand perspective—it is a substantial portion of the U.S. economy. Question #3 addresses the seemingly common view that “the U.S. doesn’t produce anything anymore” and the implicit idea that foreigners have somehow taken advantage of us.

However, after doing several exercises where students had the wrong answer, it dawned on me that telling students more than a time or two that they were wrong was a poor strategy. This was confirmed in a conversation at the NCAT conference with Noah Finkelstein, a professor in physics education from the University of Colorado at Boulder. He argued that it leads students to distrust their intuition. A better strategy would seem to be to lead them through exercises to the correct answer so that they can form their own understanding. For example, on the misconception above on flexible prices, one could having students “Google” for examples of government controlled prices and then let them come to the conclusion that indeed most prices are flexible.

4 Empirical Findings

The idea for this study did not arise until after the start of the semester, so there was no pre-test and it was thus impossible to examine the value added by the course. To evaluate changes from the previous time this large class was taught, the Spring of 2006, this class’ final exam included 16 questions from that class (students were not permitted to keep the final). The results are in Table 1.

Table 1: Common Question Results

Variable	Mean	Median	Std. Dev.	Obs.
2006 Scores	11.2429	12.0000	2.33203	210
2007 Scores	11.5464	12.0000	2.10756	291

The scores on the common questions increased by 2.8%. The null hypothesis that the means are equal cannot be rejected with various formulations at a significance level of 5%. Assuming an equal common population standard deviation, the one-tailed p-value was 0.065 and the two-tailed p-value is 0.129. If the assumption of a common population standard deviation is relaxed, the one-tailed p-value is 0.067 and the two-tailed one is 0.135. Figure 2, with bins of 2 correctly answered questions, shows the difference in the distribution of the scores. There was a small decrease in the percent of students who answered 7 or 8 questions correctly and a roughly equivalent number who answered 11 or 12 questions correctly. I checked to see if there was a notable change in class characteristics (majors or year) and found none. In short, it is very difficult to argue that changing the course had an impact on learning.

Additional information was found in the course evaluations. However, they must be treated with caution given the sample size: 44% in the Spring of 2006 and 55% in the Spring of 2007.* Some relevant data from the evaluations are found in Table 2. For each category, 1 is the “best” and 5 is the “worst”. By these measures, it appears that changes in the course had an impact. Of particular note are the improvements in “Intellectually motivated by the course” and “Your general estimate of the course.” In spite of little measured change in learning, the change in the course does appear to have had a positive impact on student attitudes.

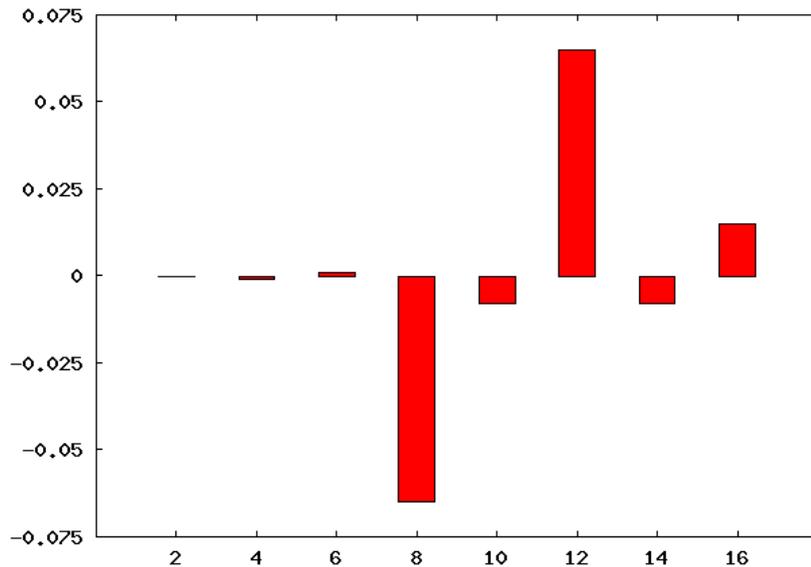


Figure 2: Common Question Breakdown: # Correct Compared to Previous Course

*I do not have ready access to total attendance per class, but I do have the sense that it was better in the Spring of 2007. I recall noting that attendance seemed abnormally low on evaluation day in the Spring of 2007.

Table 2: Selected Parts of Student Evaluations

<i>Question</i>	2006	2007
Clear course objectives	2.07	1.84
Course organization	2.01	1.76
Subject matter presentation	2.41	2.04
Teaching effectiveness	3.23	2.67
Intellectually motivated by the course	3.50	2.83
Your general estimate of the course ^a	3.25	2.53
Overall (mean of all elements)	2.75	2.25

^a“interesting, informative, useful, to dull, boring, uninformative”

The next section analyzes why there was no detectable increase in learning, but first some other data will be analyzed to see if further insight on this class can be gained. The survey in the *Class Survey Instrument* Section was attached to the final exam, but of course there was no credit attached to it. Given its voluntary nature, not all answered every question. I also collected other data from the course management software: if they had accessed at least one exam key and if they had accessed the course study suggestions. Finally, I had attendance data from the clickers. Table 3 shows the best fit of the data where the dependent variable is the score on the final exam. As can be seen by comparing the results with the data gathered by the survey, most variables were insignificant.* Consistent with findings in other papers, attendance is highly significant and of considerable size. The same is true with accessing the on-line exam keys and the study suggestions. Interestingly, the self-reported attendance data is generally independently significant as well. Unfortunately, these explain only 27% of the variation in final exam scores. All of the independent variables may be capturing not only what they directly measure but also factors such as conscientiousness. In the end, the OLS results are unremarkable: going to class, using class materials, and perhaps being serious about one’s studies, leads to a higher final exam score.

Table 3: OLS estimates of Final Exam Scores
215 observations
Dependent variable: Final Exam Score

Variable	Coefficient	Std. Error	t-statistic	p-value
constant	53.0279	4.36972	12.1353	0.0000
Classes Attended	0.907000	0.206895	4.3839	0.0000
Read On-line Study Suggestions	5.51169	2.17549	2.5335	0.0120
Read On-line Exam Keys	6.24719	2.10311	2.9705	0.0033
Dummy: Self-reported 1-2 Classes Missed	-3.4009	2.34213	-1.4521	0.1480
Dummy: Self-reported 2-4 Classes Missed	-3.2485	2.41250	-1.3465	0.1796
Dummy: Self-reported 4-6 Classes Missed	-5.4683	2.76500	-1.9777	0.0493
Dummy: Self-reported >6 Classes Missed	-5.7229	3.24446	-1.7639	0.0792

*The question on mindset may not have been entirely their own as I talked about this topic the first day of class.

Mean of dependent variable	69.1116
Unadjusted R^2	0.273080
$F(7,207)$	11.1090

5 Reflections

I was discouraged to not find a statistically significant change in learning. However, the apparent improvement in student evaluations were welcome. There seem to be three possible explanations that may well overlap. First, as [Becker \(1982\)](#) and [Allgood \(2001\)](#) argue, students may find it optimal not to improve their performance when an innovation makes learning easier. I had hoped that the changes I made would encourage greater engagement, but perhaps I was mistaken. The improvements in evaluations, but not learning, might be some support for this hypothesis. Second, upon rereading [Bain \(2004\)](#) and finding [Wieman \(2007\)](#), I was struck that I still conducted the typical class in the “transmission” mode. I spent so much effort on the other innovations that this seemingly critical facet had escaped my attention. In a typical day there was a simple clicker exercise or two, but in general class time was very much dominated by me talking. It retrospect, it is quite clear that the class was not set up to lead students to develop their own understanding. Third, perhaps an insufficient number of misconceptions were identified and acted upon. Given their nature, they are difficult to identify, but perhaps more are lurking in our students’ minds that hinder their learning.

With the above in mind, I will work on the following for the Spring of 2008:

- build on my redesigned course structure to one where each class is built around a series of significant questions that will be checked with a clicker as [Wieman \(2007\)](#) advocates
- change my mindset from where I try to find the “best” explanation to one where I lead them to build their own understanding
- gather more data to better understand where students fail; this can be done by both sophisticated clicker exercises and with the course management software (such as asking them how much time they spent on the class in the previous week to perhaps timing their use of on-line course materials)
- provide more out of class exercises; for example, mastery-learning in the course CMS
- reorganize the end of the semester with questions
- identify more misconceptions.

The issue of misconceptions seems particularly important. Both [Bain](#) and [Wieman](#) stress this point * yet the economic research appears thin, and other than some fallacies discussed in introductory chapters, textbooks rarely address this topic. Doubtless many instructors already address the ones they know, but their findings are not widely shared. Misconceptions clearly hinder learning. For example, few students in this class knew that the government sets but a handful of prices. This clearly leads to confusion when concepts such as prices allocating resources or the drawbacks of price ceilings and floors are discussed. Further, in this light, students must implicitly wonder why so much time is spent describing what determines prices.

*Physicists collect extensive data on misconceptions in their field.

While relatively uncommon, several surveys and analyses of them have been conducted. The surveys include [Federal Reserve Bank of Minneapolis \(1998\)](#), [Walstad and Larsen \(1992\)](#), [Walstad \(1994\)](#), and [Blendon et al. \(1997\)](#). Interpretations, which provide deeper insights, include [Rubin \(2003\)](#) and [Caplan \(2007a\)](#)* (both generally based on [Blendon et al. \(1997\)](#)). [Rubin \(2003\)](#) also incorporated findings from traits in early human societies that influence current views, such as trade generally being zero-sum, prices have little impact on demand, and that there are a fixed number of jobs. [Caplan \(2007a\)](#) found four large areas of misconceptions: “anti-market bias” (an underestimation of markets and how profit maximization leads to social benefits), “anti-foreign bias” (an underestimation of the benefits of international trade and immigration), “make-work bias” (labor-saving technology may cause unemployment) and “pessimistic bias” (economic conditions are poor and may well worsen). [Madariaga \(2005\)](#) also lists misconceptions. While quite interesting, an instructor might wonder if the above set is all-encompassing, if the results have changed in the ten years since the last survey, if the questions address the typical student’s world view, or if these are the key misconceptions that hinder learning as opposed to understanding current economic debates. There seem to be considerable possibilities here for further research.

6 Conclusion

This paper described [Bain \(2004\)](#) and how ideas from it were implemented in a large macro principles course in the Spring of 2007. While not used that Spring, [Wieman \(2007\)](#) lists best practices in physics education that is remarkably consistent with Bain. Unfortunately, there was not a statistical difference in common final questions compared to the previous time this large class was taught. However, it appears that student satisfaction was substantially higher. Further, there is very considerable room to implement more of Bain’s findings in the Spring of 2008. The appropriate analogy would seem to be Bain’s finding that deep student learning often takes multiple runs through the material. In my case, this implies that it will take me several tries to implement his wide-ranging ideas. To aid this task, a final point from [Bain \(2004\)](#) and [Wieman \(2007\)](#) will be employed: more data collection and analysis.

*A summary can be found in [Caplan \(2007b\)](#).

7 Class Outline

Why do economies grow (or not)?

1. Why do economies grow over decades and centuries?
 - (a) How to measure growth—changes in “real per capita Gross Domestic Product (GDP)”
 - (b) Why Does Real Per Capita GDP Increase?
 - (c) Answer to the Question “Why Do Economies Grow Over Decades and Centuries?”
 - (d) Aside—Productivity Increases this Decade
 - (e) How Can International Trade Help an Economy Grow?
2. How Do Markets Help Economies Grow?
 - (a) Of the prices of goods and services that you buy, what percent are set or controlled by the government?
 - (b) How do markets & “flexible prices” help economies grow?
 - (c) Where do prices come from?
3. Economic Growth (or Not) in the Short Run
 - (a) Recessions, Expansions, & the Business Cycle
 - i. What is a recession?
 - ii. What causes them?
 - iii. What can be (if anything) about them?
 - iv. If something can be done, who can do it?
 - (b) What Is Unemployment & What Is Its Connection to Recessions?
 - i. Aggregate Demand
 - ii. Long Run Aggregate Supply
 - iii. Short Run Aggregate Supply
 - iv. Equilibrium in the Short Run
 - v. A Year in a Typical Expansion
 - vi. What has Caused Recessions in the Postwar Era?
 - vii. Summary
 - viii. Monetary Policy and the Federal Reserve
 - ix. Fiscal Policy
 - x. Problems with Fiscal Policy
 - xi. Advice on Your Retirement

8 Syllabus

Economics 200-800 Macroeconomics 11:10—12:30, Tuesday & Thursday, Lanigan 101

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Office: Mahar 416

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Moodle (course web page): I'd prefer e-mail.

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Office Hours: Monday, 2:00—3:30, Tuesday & Thursday 2:00—3:30, and by appointment.

Course Description

Economics courses are often considered difficult and their material is too abstract for everyday use. But, as we'll see this semester, while the material is indeed challenging, it does an excellent job of describing the world we live in. It probably isn't a surprise that economics is the second most common major among corporate CEOs or that 3 of the last 6 presidents were economics majors. (Tiger Woods was an economics major too, but I doubt it helped his golf game!) While none of us are likely to reach such heights, these famous and very capable economics majors do illustrate the power of the topics you'll learn this semester. In this class you'll have numerous opportunities to use economic concepts and frequently we'll go through them more than once so you can gain a deep understanding. You'll also have a number of opportunities to demonstrate your mastery of the material. However, I do need your commitment of time and effort so you can learn this material. In a very real way, it is much like exercise. Without time in the gym or practice field, you cannot hope to be successful in your chosen sport. Time and effort in this class offers the similar rewards. Finally, as you likely know, macroeconomics studies the economy at large, so we will cover topics like GDP, inflation, and unemployment, but we will do some microeconomics during the semester, when we study individual markets.

Course Philosophy

1. Most of us don't learn complex concepts, like we'll see in this course, the first time you see it. Most of us need several rounds of studying, trying, and evaluation to master complex material.
2. Today's employers demand and pay for skilled employees. They aren't so much looking for specific skills but advanced "cognitive" skills like synthesizing complex material, the ability

to communicate, and the ability to learn on the job. The specific skills you learn here at Oswego will be obsolete in just a few years, but your ability to learn and other cognitive skills will be used for the rest of your life.

3. The human brain is very “plastic” and capable of reorganizing itself if pressed to do so. We don’t have a fixed amount of ability or knowledge. As a result, almost everybody will be able to acquire the skills required for today’s best jobs.

Course Materials

Macroeconomics, Glenn Hubbard and Anthony O’Brien (custom edition for this course). The bookstores may be out at the moment, but more are expected by January 31 at the latest.

InterWrite PRS “clicker.” These should be in the bookstores and the custom edition of the text has a \$20 rebate coupon for one. If you have used one in a previous class, you can use it in this class. If you bought a used book you’ll need to purchase a clicker.

Wall Street Journal. When you buy the custom edition, you should find a coupon enclosed for a pre-paid subscription. Be sure to send it in without delay as we will be using it very soon. If you bought a used textbook you will need to get a 15 week subscription (for \$30) at <http://subscribe.wsj.com/semester>. Note that the Wall Street Journal is not a free web site and the library offers a very poor interface for it. Be sure to save assigned articles as you can’t get old ones for free past 90 days. If you get the print version, you only need to keep two week’s worth of the complete paper. If I haven’t assigned it by then, I won’t.

Adobe Acrobat Reader free at <<http://www.adobe.com>> and click on “Get Adobe Reader” (on all campus lab PCs)

Microsoft PowerPoint available on most PCs (on all campus lab PCs; Google for “free powerpoint viewer” to get one)

Class Web Site: <<http://cook.rfe.org/moodle/course/view.php?id=15>> (it may be easier to start at goffe.oswego.edu and follow the links). Notes will be placed there, as well as readings, articles, and on-line quizzes. Each student has an account on this site; your Oswego userid (the part of your Oswego e-mail address before the “@”) is your userid on this system. Your Oswego ID number is the password. If these do not work it means that either you aren’t officially enrolled or I haven’t updated the roster. Please don’t try register if these don’t work; instead e-mail me. Note that I won’t load accounts into the system until Monday, 1/29. Feel free to change your password if you wish, but do not change your userid and also do not change your name or “surname” (the software is Australian and surname is what we call your last name). It causes me endless hassles when people change their names. Simply put, please do not do it. Class announcements will be sent to

your Oswego e-mail address. If you wish to have e-mail from that addresses forwarded to another address, please see oswego.edu/admin.

Grading, Attendance, and Other Policies

MY CONDUCT:

- I will start class on-time and will not hold you beyond the end of class.
- I will get exams back to you quickly (hopefully the next class period).
- I will respond to your e-mail in 24 hours or less (typically much less).
- I will be predictable in what I test on.

YOUR CONDUCT:

- I simply ask that you be respectful of me and others in the class.

SLEEP: Please get enough sleep. Yes, it might seem odd to mention this, but getting drowsy during the day is **not** normal human behavior. People with sufficient sleep also learn better as sleep recharges your brain and helps it organize what you've learned. Many mistakenly think they can get by on little sleep. I liked what one 19-year old said after taking part in a study where he slept 9 hours a night: "You know, this is really good. I might try this even when the study's over...".

CALCULATION OF THE COURSE GRADE: First, let me say that I would like to discourage a focus on grades and instead emphasize learning the material. When you know the material the grades will naturally follow. I will give you several opportunities to show that you have mastered the course material. As above, most of us don't learn complex material like economics the first time through and instead we need to try, see what we understand and don't, focus on what we don't, and then try again. Many of us need to repeat this process several times. In general, you will first see material in class or in a reading and I'll use the clickers to evaluate your understanding. You'll often next see the material in a quiz the next class or in an on-line quiz. We'll go over the quizzes and then you'll see it on exams, and we'll go over exams. In short, you and I will have many opportunities to evaluate your learning. Along these lines, the exam coverage is cumulative. The material we do the first week is just as important the second week as it is the fifteenth week. Along these lines, if you do better on a later exam it replaces your earlier exam and quiz scores. In short, you and I will have a number of opportunities to evaluate your mastery of the material.

With this in mind, the quizzes (in-class and on-line) are 30% of the course grade, the final exam is 30%, and the two exams during the semester are 20% each. The five lowest in-class quiz scores will be dropped to deal with the occasional absence. For the course, I use a 100 point scale and 10-point divisions are used to assign letter grades for the course, so any score from 90 to 100 will be an A, 89 to 80 a B, and so on. Plus and minus grades are given—any grade ending from 3.3 to 6.7 won't have a plus or minus, but below will be a minus and above a plus. Thus, a 83.2 will be a B- and an 86.8 will be a B+. There is no rounding or curving.

EXAM AND FINAL ATTENDANCE POLICY: Five drops are built into the quizzes to handle the occasional absence. Sometime during the semester you'll be sick, have trouble starting your car, have a job interview, have a college sporting event you must attend as a college athlete, have a mandatory religious observance, have a wedding you must attend, etc. so be **very** careful using them. If you cannot consistently attend class, you must contact me. If no prior arrangement is made and you miss an exam, it will increase the weight on the final. Exam times will only be changed in extraordinary circumstances. The final must be taken at the assigned time.

DISABILITY POLICY: If you have a disabling condition which may interfere with your ability to successfully complete this course, please contact Disability Services, 226 Hewitt Union, 312-3358. I am more than happy to work with you, but an evaluation must be made by Disability Services.

CHEATING AND PLAGIARISM: See http://www.oswego.edu/administration/registrar/policy_text.html#cpii for the college policy on cheating and plagiarism. As described there, penalties include a failing grade for the course.

Important Dates

Last Day to Add a Class	Monday, Feb. 5
Last Day to Drop w/o Penalty	Wednesday, Feb. 14
Exam I	Thursday, March 1
Spring Break	March 19-23
End of Course Withdrawal Period	Friday, March 30
Good Friday and Spring Break Day	Thursday-Friday April 5-6
Exam II	Thursday, April 19
Last Day of Classes	Friday, May 11
Final Exam	Tuesday, May 15, 10:30—12:30
Graduation	Saturday, May 19

9 Clicker Exercise on Economic Growth

To put growth into intuitive terms I gave an assignment where I asked the students to find the oldest person they knew. Some of the following are for that person and some are for the student. Results were collected in class with clickers.

- 1 In what year were you my age?
 - a 1930s
 - b 1940s
 - c 1950s
 - d 1960s
- 2 In your immediate family, how many cars did you own when you were my age?
 - a 0
 - b 1
 - c 2
 - d 3
- 3 In your family today, how many cars do you own?
 - a 0
 - b 1
 - c 2
 - d 3
- 4 How many states had you been to when you were my age?
 - a 1
 - b 2-3
 - c 4-6
 - d >6
- 5 How many states have you been to?
 - a 1
 - b 2-3
 - c 4-6
 - d > 6
- 6 Did you have a roommate when you were growing up when you were my age?
 - a yes
 - b no
- 7 Did you have a roommate?
 - a yes
 - b no

10 Class Survey Instrument

As you know, I changed just about everything in this course for this semester. Next I'll be studying how well these changes worked. As part of this project, it will help me if you would take a few minutes to answer the following. Let me hasten to add that this is 100grade. Your data will be kept private. However, it will help me to better tailor this course to future students. If you decide to participate, please start filling in with answer 51 on your Scantron. I'll be glad to provide my findings to anyone who asks.

- 1 Which most accurately describes your study environment most of the time:
 - a a computer is on and you're multitasking (say using IM or visiting web sites)
 - b music is playing in the background or on headphones
 - c a TV is on the background
 - d a TV or music is on and you're multitasking on a computer
 - e it is pretty quiet
- 2 Why did you sign up for this section?
 - a convenient time
 - b reputation of the instructor
 - c no other section open
 - d other
- 3 Why did you sign up for Econ 200?
 - a Gen Ed
 - b required for a non-economics major
 - c economics major
- 4 At the end of the semester, attendance dropped off. If this included you, what was the primary reason?
 - a the class was boring
 - b there were better uses of my time
 - c I could get the grade I needed even if I didn't come to class
 - d coming to class doesn't make much difference in the course grade
 - e other
- 5 About how much did you study per week for this course?
 - a none to 30 minutes
 - b 31 minutes to 1 hour
 - c > 1 hour to 2 hours
 - d > 2 hours to 3 hours
 - e > 3 hours

- 6 About how many classes did you miss?
- a none
 - b 1-2
 - c 2-4
 - d 4-6
 - e more than 6
- 7 How many of your parents attended college?
- a neither
 - b one
 - c both
- 8 How many of your parents graduated from college?
- a neither
 - b one
 - c both
- 9 How many siblings of college age or older do you have?
- a 0
 - b 1
 - c 2
 - d 3
 - e 4 or more
- 10 Of your siblings of college age or older, how many are currently in college?
- a 0
 - b 1
 - c 2
 - d 3
 - e 4 or more
- 11 Of your siblings who are old enough to have graduated from college, how many have?
- a 0
 - b 1
 - c 2
 - d 3
 - e 4 or more
- 12 You are a
- a freshman
 - b sophomore
 - c junior
 - d senior
 - e grad student

- 13 What is your age?
- a 18-19
 - b 20-21
 - c 22-24
 - d 25-26
 - e 27 or more
- 14 Your GPA is
- a 4.0—3.0
 - b 2.9—2.0
 - c 1.9—1.0
 - d 1.0—0.0
- 15 There are basically two views of intelligence. One view is called “fixed mindset” which says that throughout life you pretty much have the intelligence you were born with. The other view is called “flexible mindset” and it says that you can add to your intelligence as you learn. Which of these best describes your view?
- a fixed mindset
 - b more fixed than flexible mindset
 - c more flexible than fixed mindset
 - d flexible mindset
- 16 Are you a transfer student?
- a no
 - b yes; from a junior college
 - c yes; from another senior college
- 17 How do you feel about a large section like this?
- a I prefer it to a small class
 - b I’m indifferent between a large and small class
 - c I prefer a small class
- 18 As you know, there were some distractions in this class. To you they were
- a not a big deal
 - b somewhat irritating
 - c quite irritating

References

- Allgood, Sam**, “Grade Targets and Teaching Innovations,” *Economics of Education Review*, October 2001, 20 (5), 485–493. <<http://www.sciencedirect.com/science/article/B6VB9-43FW135-6/2/f12d4a4915293bc130516dc62e37f882>>. 2, 14
- Bain, Ken**, *What the Best College Teachers Do*, Harvard University Press, 2004. 1, 3, 5, 6, 7, 14, 15
- Becker, William E.**, “The Educational Process and Student Achievement Given Uncertainty in Measurement,” *The American Economic Review*, March 1982, 72 (1), 229–236. <<http://links.jstor.org/sici?sici=0002-8282%28198203%2972%3A1%3C229%3ATEPASA%3E2.0.CO%3B2-S>>. 2, 14
- Blackwell, Lisa S., Kali H. Trzesniewski, and Carol Sorich Dweck**, “Implicit Theories of Intelligence Predict Achievement Across an Adolescent Transition: A Longitudinal Study and an Intervention,” *Child Development*, 2007, 78 (1), 246–263. <<http://www.blackwell-synergy.com/doi/abs/10.1111/j.1467-8624.2007.00995.x>>. 5
- Blendon, Robert J., John M. Benson, Mollyann Brodie, Richard Morin, Drew E. Altman, Daniel Gitterman, Mario Brossard, and Matt James**, “Bridging the Gap Between the Public’s and Economists’ Views of the Economy,” *The Journal of Economic Perspectives*, Summer 1997, 11 (3), 105–118. <<http://links.jstor.org/sici?sici=0895-3309%28199722%2911%3A3%3C105%3ABTGBTP%3E2.0.CO%3B2-0>>. 10, 15
- Caplan, Bryan**, *The Myth of the Rational Voter: Why Democracies Choose Bad Policies*, Princeton University Press, 2007. 15
- , “The Myth of the Rational Voter: Why Democracies Choose Bad Policies,” Cato Institute, Policy Analysis no. 594, May 29, 2007. <http://www.cato.org/pub_display.php?pub_id=8262>. 15
- Easterbrook, Gregg**, *The Progress Paradox: How Life Gets Better While People Feel Worse*, Random House, 2004. 10
- Ericsson, K. Anders, Ralf Th. Krampe, , and Clemens Tesch-Romer**, “The Role of Deliberate Practice in the Acquisition of Expert Performance,” *Psychological Review*, 1993, 100 (3), 363–406. <<http://projects.ict.usc.edu/itw/gel/EricssonDeliberatePracticePR93.pdf>>. 7
- Federal Reserve Bank of Minneapolis**, “Economic Literacy Survey,” *The Region*, December 1998, 12 (4), 12–15. <<http://www.minneapolisfed.org/pubs/region/98-12/survey.cfm>>. 15

- Fernandez, Manny and David Staba**, “8 Days, 10 Feet and the Snow Isn’t Done Yet,” *New York Times*, February 12, 2006. <<http://www.nytimes.com/2007/02/12/nyregion/12snow.html>>. 9
- Glenn, David**, “You Will be Tested on This: Researchers Are Dusting Off an Old Insight: To Maximize Classroom Learning, Quiz Early and Often,” *Chronicle of Higher Education*, June 8 2007, 53 (40), A14+. <<http://chronicle.com/weekly/v53/i40/40a01401.htm>>. 5
- Halloun, Ibrahim Abou and David Hestenes**, “The Initial Knowledge State of College Physics Students,” *American Journal of Physics*, November 1985, 53 (11), 1043–1055. <<http://modeling.asu.edu/r&e/InitialKnowledge.pdf>>. 4
- Krauthammer, Charles**, “Where Presidents Have No Power,” *Time*, May 10, 2004. <<http://www.time.com/time/printout/0,8816,994138,00.html>>. 11
- Madariaga, Bruce**, *Economics For Life: 101 Lessons You Can Use Every Day!*, Houghton Mifflin, 2005. 15
- Maier, Mark and Scott Simkins**, “Building the Teaching Commons: What can Economists Learn from Physics Education Research?,” Presented at the Southern Economics Association Annual Meeting, November 2006. 8
- NCAT, The National Center for Academic Transformation**. <<http://thencat.org/>>. 2
- Perry, William G.**, *Forms of Ethical and Intellectual Development in the College Years: A Scheme*, Jossey-Bass, 1998. 5
- Roediger, Henry L. and Jeffrey D. Karpicke**, “Test-Enhanced Learning. Taking Memory Tests Improves Long-Term Retention,” *Psychological Science*, 2006, 17 (3), 249–255. <<http://www.blackwell-synergy.com/doi/abs/10.1111/j.1467-9280.2006.01693.x>>. 5
- Rubin, Paul H.**, “Folk Economics,” *Southern Economic Journal*, July 2003, 70 (1), 157–171. 15
- Saunders, Phillip**, “Learning Theory and Instructional Objectives,” in William B. Walstad and Phillip Saunders, eds., *Teaching Undergraduate Economics: A Handbook for Instructors*, McGraw-Hill/Irwin, 1997, pp. 85–108. 5
- Walstad, William B.**, “Entrepreneurship and Small Business in the United States: A Gallup Survey Report on the Views of High School Students, the General Public, and Small Business Owners and Managers,” 1994. Ewing Marion Kauffman Foundation, Kansas City, Missouri. 15
- **and Max Larsen**, “A National Survey of American Economic Literacy,” 1992. The Gallup Organization. 15
- **and Sam Allgood**, “What Do College Seniors Know about Economics?,” *The American Economic Review*, May 1999, 89 (2), 350–354. <<http://links.jstor.org/sici?sici=0002-8282%28199905%2989%3A2%3C350%3AWDCSKA%3E2.0.CO%3B2-T>>. 4

Wieman, Carl, “Why Not Try a Scientific Approach to Science Education?,” *Change*, September/October 2007, 53 (40), 9–15. <http://www.cwsei.ubc.ca/resources/files/Wieman-Change_Sept-Oct_2007.pdf>. 1, 7, 8, 14, 15

Wood, William C., “The Principles of Macroeconomics Class: Teaching Aggregate Thinking,” 2007. Allied Social Science Association Annual Meeting, 2007, Chicago. 2