A Survey of Principles Instructors: Why Lecture Prevails*

William L. Goffe
Department of Economics
Penn State University
bill.goffe@psu.edu

David Kauper
California Franchise Tax Board
david.kauper@gmail.com

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1 Introduction

For many years, surveys have shown that lecture is the dominant method for teaching Principles of Economics (most notably Watts and Schaur (2011), Watts and Becker (2008), Becker and Watts (2001a), Becker and Watts (1996)). This paper confirms the predominance of lecture and adds to the existing literature by asking why principles instructors have selected their particular teaching methods. The respondents, 275 principles instructors at the 2012 ASSA conference, roughly group into thirds: one saying that students learn best from lecture, another reporting that students do not learn best from lecture, but that it is cost-effective, and the rest answering that students do not learn best from lecture, so alternatives are preferred.

The typical respondent is a tenure-track faculty member at a Ph.D.-granting institution with five years of teaching experience and limited pedagogical training—typically citing either on-the-job experience and/or informal discussion with colleagues. The median respondent reports spending 70% of class time lecturing, 20% leading class discussion, and 10% percent using other learning activities such as experiments, group activities, peer instruction, clickers, etc.

The most common explanation of lecture's efficacy, by the third who favored it, is the ability to control the delivery and coverage of content. This group even seems to have difficulty conceptualizing anything other than lecturing. For the third who felt that students do not learn best from lecture but that it is cost effective, the added effort needed for preparation of lecture alternatives keeps them lecturing. Interestingly, they rarely explicitly mention time conflicts with research. For the remaining third, the most common explanation of non-lecture methods' efficacy is the students' active involvement leading to increased learning. This group seems to have the most sophisticated views of student learning.

This paper is organized as follows. Next is a literature review and following that is a description of the survey instrument and its administration, while following that is an analysis of the data. A conclusion completes the paper.

2 Literature Review

When teaching Principles of Economics, lecture prevails. This is true now, with Watts and Schaur (2011) finding that the median respondent spends 83 percent of class time in their Principles courses lecturing. More specifically, Watts and Schaur (2011) find that most of their survey respondents indicated that they spend 66-100 percent of class time lecturing, and fewer than half of them indicated either 0 percent, 1-10 percent, 11-33 percent, or 34-65 percent of class time lecturing.

And this has been true for some time—Becker and Watts (1996, 2001a,b), Benzing and Christ (1997), and Watts and Becker (2008) found identical or similar results in prior surveys. Economics instructors seem particularly fond of

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lecture, at least according to graduates memories of their college courses (Allgood, Bosshardt, Van Der Klaauw and Watts, 2004). More broadly, lecture prevails in the Social Sciences in general (Finkelstein, Seal and Schuster, 1998), so economists are not unique in this regard.

Lecture might prevail in instructor use, but it does not prevail in student outcomes. A significant amount of research shows that alternatives to lecture yield more learning and other improved student outcomes. In one striking example, the students of novice instructors scored almost twice as high as the students of experienced, highly evaluated instructors (Deslauriers, Schelew and Wieman, 2011). Midway through an Introductory Physics course, in a treatment section, two instructors, who only had teaching-assistant experience but were trained in research-based instructional strategies (RBIS), used the class time to instruct with methods based on findings from cognitive psychology. They had the students work through challenging but doable physics problems together in class, and the instructors provided guidance and feedback. They did not lecture. In the control section, the regular professor lectured as usual. The next week students in both sections were tested on the material, and the average score in the treatment section was 74 percent, versus 41 percent in the control section–in other words, passing instead of failing.

Crouch et al. (2007) used peer instruction as well to engage their physics students in the classroom at Harvard University and Swarthmore College with the result that student scores on a standardized physics test increased from 66% in early classes based on lecture to 79% in later classes that utilized peer instruction. They achieved similar gains in other comparisons of student learning. In addition, from their survey of over 700 math and science college instructors, about half of them using peer instruction, they found an average normalized gain of 0.39—in other words, on the post test, the average student closed 39% of the gap between his/her pre test score and a perfect score.[a]

In a larger study, Beichner et al. (2007) found similar results. In their project at twelve universities involving over sixteen thousand physics students, in some of the classes the instructors replaced lecture with collaborative activities such as homework and labs involving real-world and conceptual problems. In post tests, the normalized gains were twice as high for students in the classes using alternatives, than in those using lecture. Hake (1998) also found similar results in his survey involving sixty-two physics courses with six-thousand students, 100% of the lecture-based courses reported normalized gains below 0.30 and 0% above 0.30, while only 15% of the interactive-based courses reported normalized gains below 0.30 and 85% had gains above 0.30. The average gain for the lecture-based course was 0.23, and that for the interactive-based courses was 0.48–a notable difference.

Looking across disciplines, Prince (2004) finds similar results. In his meta-study, Prince cites other studies of existing research: Laws, Sokoloff and Thornton (1999) found that active learning could more than double learning outcomes when students were engaged in the activities; Johnson, Johnson and Smith (1998a,b) found that learning outcomes increased by 0.53 to 0.64 standard deviations when students worked together in collaborative learning;[b] and if, in addition, the students were not competing with each other for grades, then academic achievement increased by an average of 0.88 standard deviations (Johnson et al., 1998a,b). The potential for helping students by lecturing less seems great.

Several studies have also shown an increase in learning in economics courses from RBIS. [c] In one course (Lage et al., 2000) lecture was moved outside of class through the use of videos and webcasts, whereas learning activities were moved into the classroom. The 189 students reported, on average, increased learning in the "Inverted Classroom." In Simkins and Maier (2004) the control group had three to four Just-in-Time Teaching (JiTT) assignments, whereby the assignments are completed and graded just before the class meeting so that they can be discussed in class. The control group scored higher on average on all of the exams, and in most cases six to twelve, statistically significant percentage points higher.

In a third example (Yamarik, 2007), one Intermediate Macroeconomics class was taught with standard lecture and two were taught with cooperative learning, specifically students worked together in small groups for approximately half of the class meetings. He found that exam performance increased three to four percent for the students in the

[a] Normalized gains are often used in physics education research; it is $(posttest - pretest)/(100 - pretest)$. It corrects for high pre test scores that otherwise wouldn't show much improvement.

[b] Prince (2004) also cites Springer, Stanne and Donovan (1999), who conclude that on average collaborative learning increases learning outcomes by 0.51 standard deviations.

[c] The pedagogic research in economics is more anecdotal, although still positive. In a survey of the literature, Becker (2004) reports that most of the literature is either merely descriptive or analytical but not statistically rigorous. While he does cite some effective uses of lecture alternatives, he also cites cases in which students had to work harder in order to achieve the same grades. Here, we report the handful of published studies that we could find.

cooperative learning sections. In a fourth example (Emerson and Taylor, 2004) students in the treatment sections with frequent experiments scored 15 percent higher on the Test of Understanding College Economics (TUCE) than students in the control group.

Understanding the material can also manifest itself as the ability to apply it. In a fifth case of teaching economics, students in the treatment sections that first worked collaboratively on problems before receiving instructor feedback in class scored just slightly better on multiple-choice exams than students in the control group, but not statistically significantly so (Marburger, 2005). However, the treatment students scored statistically significantly better on applications of the material to real-world scenarios. In other words, the biggest gains from using RBIS were in deep learning. To paraphrase Marburger, the potential for getting students to think like economists seems great (Marburger, 2005).[d]

While there is not as much research on the learning gains from using RBIS in economics as there is for physics and some other disciplines, the gains in economics are consistent with potential widespread gains. Economics instructors consistently report small to large gains of RBIS over lecture. Physics instructors consistently do too, just with a larger sample size.[e]

Another strand of literature concerns why college instructors teach the way they do. Again, it appears that the most extensive research has been in physics, where, for example, Henderson, Dancy and Niewiadomska-Bugaj (2012) surveyed 772 introductory college Physics instructors. found that only 12 percent were unaware of RBIS, while 39 percent were aware but chose not to use them. This was comprised of 16 percent that had never tried them, and 23 percent that had in the past but since discontinued use.

Of the twenty independent variables that Henderson et al. tested against usage of RBIS, only six were statistically significant: 1) interest in using RBIS; 2) number of teaching journals regularly read; 3) attendance of pedagogical talks or workshops; 4) attendance of the national New Faculty Workshop; 5) type of institution; and 6) gender. The first variable simply tells us that the choice to use alternative teaching methods is likely voluntary. The second and third are probably a result of the first. The fourth might represent a potential real influence in encouraging faculty to trying alternatives to lecture, but it is not correlated with the choice to continue using RBIS (Henderson et al., 2012). The fifth could reflect time constraints where institutions require publication, but it also is not correlated with the decision to continue use of RBIS (Henderson et al., 2012). Only the sixth is correlated with continued use of RBIS (Henderson et al., 2012) and might additionally provide insight into why some instructors stick with lecture and others do not.

In another survey, Henderson and Dancy (2011) asked faculty the question: "What prevents you from using more [research-based instructional] strategies?" The authors categorized "the most salient situational constraints" as: 1) expectations of content coverage; 2) lack of instructor time; 3) departmental norms; 4) student resistance; 5) class size and room layout; and 6) time structure. All of these constraints are surely costs. The aforementioned improved student learning is among the many benefits of alternatives to lecture. Costs must be weighed against benefits. Is the efficient balance in economics really at just 17 percent of class time used for activities other than lecture and 83% of the time lecturing? Are economics instructors actually achieving efficiency in the classroom?

Of course there are fixed costs of learning of and how to use the techniques, but these should not explain why so many instructors are aware of alternative methods but have not tried them, or explain why so many that have tried alternatives do not continue their use. Tagg (2012) points out additional costs of changing teaching methods. He argues that college professors enjoy their individual freedom in academia and strive to maintain it. He furthers that irrational behavior of "[l]oss aversion and the endowment affect add up to the *status quo bias*... " (italics in original). Implicitly, instructors overestimate the benefits of lecture and consequently teach inefficiently. In other words, students learn much less than they should.

We would like to better understand the reliance on lecture and to this end surveyed instructors of Economics Principles courses, seeking to reveal how they decide when to lecture versus using alternatives. We asked them open-ended questions about their perceived costs and benefits in order to better understand the incentives they face. We seek to find the logic behind their decisions and, by implication, see if students should be learning more.

[d]While one might be tempted to summarize the above discussion as "lecture bad, alternatives good," a more nuanced view is that in some limited circumstances that lecture can be effective. Schwartz and Bransford (1998) make this point: when students' background knowledge is considerable, lecture can indeed lead to deep learning.

[e]However, Physics has a particularly long and vibrant history of education research. For example, the American Association of Physics Teachers was founded in 1930, publishes The Physics Teacher, and hosts the national New Faculty Workshop. See http://www.aapt.org/index.cfm . Also, some 75 U.S. physics departments sponsor a "physics education research group."

3 The Survey Instrument and Its Administration

A copy of the actual survey is located at the end of the paper. As can be seen, it is on a single page with seven questions. It was hoped that its brevity would aid the response rate. All but the last question are checkboxes or fill in the blanks. The first four are demographic-style questions (rank of instructor, type of institution, years teaching principles, and type of teacher training). The fifth question asks about how class time is allocated (lecture, instructor-lead discussion, or something else). Following that respondents are asked if students learn best from lecture, if they do not learn best from lecture but it is cost-effective, or if students do not learn best from lecture and thus alternatives should be pursued. This question is patterned after Bressoud (2011), where he notes that in a survey of 700 calculus instructors, "'almost two-thirds agreed with the statement, 'Calculus students learn best from lectures, provided they are clear and well-prepared."' For economists, it seemed sensible to take a discipline-specific view and ask them about the costs and benefits of teaching with non-lecture methods. The final question is open-ended to better understand instructors' thinking.

With the cooperation of John Siegfried, the then-Secretary-Treasurer of the American Economic Association, the authors set up a booth in the hall leading to and from the registration area of the 2012 Allied Social Science Association meeting in Chicago. As conference attendees walked by, the authors asked for volunteers to fill out a brief one-page survey on the teaching of principles. To save time, statistics were not kept on refusals, so the response rate is unknown.[f] However, it is likely well below 10%. It is also unknown how many refused as they did not teach principles and how many refused for other reasons (many seemed to be in a hurry). Certainly this low response rate is a concern, but note that Watts and Schaur (2011) had a 10.5% response rate to their mailed survey. Response rates are a real concern and that apparently could use some serious research.[g]

4 Analysis of the Data

In all, 340 filled out the survey. However, many incompletely answered the first six questions and in the interest of consistency these partially completed surveys were eliminated from the data reported below. As a result 275 surveys were usable. The following tables summarize the results.

Question 1: "Which best describes you:"	
graduate student (TA experience only)	10%
graduate student (has taught own course)	14%
non tenure-track instructor	16%
tenure-track instructor without tenure	24%
tenured instructor	36%

Question 2: "What is the highest degree offered by your institution?"	
Associate's	2%
Bachelor's	8%
Master's	18%
Doctoral	72%

The responses to Questions 1 and 2 suggest that that survey respondents were at least somewhat consistent with who would seem to be the population at the ASSA—those in the job market and those keeping up with the latest research if not making presentations. Note that this distribution of institutions is roughly similar to Watts and Schaur

[f] When the hallway was crowded, one participant after another was often asked and recording the number asked would have limited the number who could have been asked.

[g] For the survey reported in this paper, it seems that acceptances were more likely when another attendee was filling out the survey. This suggests that it might be sensible that for future surveys that fake survey takers be hired.

(2011), respectively: 3%, 16%, 21%, and 61%. American Economic Association (AEA) membership is a bit different: 0%, 36%, 13%, and 51%, respectively.[h]

Question 3: "How many years have you been teaching Principles (Macro, Micro, or combined)?"	
mean:	10.0 years
median:	5.25 years

The responses to Question 3, on how many years the respondent has taught principles, are consistent with the Question 1 responses that finds that about half the respondents were either in graduate school or tenure-track without tenure, and thus presumably at the start of their careers.

Question 4: "Which best describes your training to teach? (mark all that apply)"	
formal pedagogical training in graduate school	41%
informal discussion with superiors or colleagues	49%
self-taught with on-the-job experience	60%
self-taught with published or on-line pedagogical materials	23%
on-campus workshops and training	32%
Teacher Training Program (TTP) Workshops (affiliated with the AEA)	12%
other workshops, training, or conferences	24%
at least one type of "formal training"[i]	69%
at least one type of "informal training"[j]	75%
only "self-taught with on-the-job experience"	13%

First, note that the bottom of the table that reports responses to Question 4 summarizes the various questions. Thus, the vast majority (69% have received some type of formal training and a slightly large number undertook some type of informal training. Barely more than 10% only learned on the job. The responses on "informal discussion with superiors or colleagues" seems low as one might think that such discussions occur on a regular basis. The percent of those who attended Teacher Training Program (TTP) Workshops may well be unrepresentatively high due to self-selection—perhaps they were more interested in taking the survey.

Question 5: "Over the semester, how do you allocate class time? (sum to 100%)"		
lecture-based instruction	60.7 (mean)	60 (median)
instructor-lead discussion	21.3 (mean)	20 (median)
other learning activities: experiments, group activities, peer instruction, clickers, etc.	17.8 (mean)	10 (median)

The responses to Question 5 are roughly consistent with Watts and Schaur (2011) which, as above, finds that most of their survey respondents spend 66-100 percent of class time lecturing (their survey asked respondents to bin their responses). Note that the full sample of 348 (of whom 275 fully filled out Questions 1 to 6), had very similar answers but for the median values; they were 70% for lecture, 20% for discussion, and 10% for other activities.

One might wonder how non-lecture and non-discussion methods break down by rank; this is shown in the next table. It is likely not surprising that TAs who presumably lead "discussion sections" lead in alternative teaching methods.

Question 6 asks directly how students learn best. As can be seen one-third of respondents felt that students learned best from lecture while slightly fewer felt that they did not, but at least lecture was cost-effective. Finally, slightly less

[h] We find little difference in the results below if they are weighted by AEA membership.

[i] grad school, on-campus workshops, TTP, and other workshops

[j] on-the-job experience, informal discussions, and self-taught with publications

Question 5 breakdown: mean percent of class time not on lecture or discussion by rank	
graduate student (TA experience only)	26.3
graduate student (has taught own course)	11.7
non tenure-track instructor	18.7
tenured instructor	18.8
tenure-track instructor without tenure	15.5

than 40 percent felt that lecture was not desirable. Thus, this offers a partial answer on why lecture is so common—most economists in this sample either feel that it is indeed best or that it is at least cost-effective.

Question 6: "In your view, overall,"	
"students learn best from lecture."	33%
"students do not learn best from lecture, but it is cost-effective."	28%
"students do not learn best from lecture, so alternatives are preferred"	39%

It is useful to see who has what views about lecture being the best instructional method and the next table does this. Most of the variation comes from graduate students with only TA experience, who are somewhat more bifurcated between lecture and non-lecture methods, and non tenure-track instructors, who are somewhat more disposed to non-lecture methods. Perhaps these instructors specialize in teaching and are more familiar with formal pedagogy or have thought more deeply about teaching.

Question 6 breakdown: how students learn best by instructor type			
instructor type	lecture best	lecture cost-effective	non-lecture
graduate student (TA experience only)	39.3%	17.9%	42.9%
graduate student (has taught own course)	31.6%	36.8%	31.6%
non tenure-track instructor	26.7%	22.2%	51.1%
tenure-track instructor without tenure	31.8%	31.8%	36.4%
tenured instructor	36.7%	26.5%	36.7%

The next table looks at how many felt that students learn best from lecture by type of institution. Perhaps it is not surprising that those whose primary focus is presumably teaching would feel less strongly about the efficacy of lecture.

Question 6 breakdown: students learn best best from lecture by institution	
Associate's	20.0%
Bachelor's	17.4%
Master's	28.0%
Doctoral	37.1%

Question 7 was used to better understand the thinking underlaying the responses to Question 6. As this question was free-response, responses were grouped into categories. When respondents felt that students learned best from lecture, their responses included just a statement that students learned best this way, that it best addressed the "teaching process" (the instructor's style, control of the classroom, it provides and overview, and so on), that it better addresses the "learning process" (students are more focused, students need direction, and it generates interest), and it leads to better learning outcomes. The much less common "pedagogical examples" refers to lecture alternatives, such as various types of supplements, broadly defined (like office hours, textbooks, and homeworks), to speakers and to in-class exercises. "Indirect costs" refers to the idea that there are costs to adopting non-lecture methods (thus, perhaps these few responses would better be placed in another category). Finally, a few referenced ideas from the pedagogical literature.

Question 7a: students learn best from lecture—reasons	
lecture is preferable	70%
pedagogical examples	7%
indirect costs	5%
research-based	2%
no response	15%

Responses from those who in Question 6 felt that lecture alternatives are preferable are described in the next table. "Research-based" is the most common answer; this means that their answer included concepts that generally come from the research literature, such as students learn by doing, instructors can better judge student understanding with non-lecture methods, retention is aided, and so on. A smaller number gave "pedagogical examples," which as above are specific non-lecture methods of teaching. Finally, a handful mentioned lecture itself—they generally had lecture paired with other activities.

Question 7a: students learn best from alternatives to lecture—reasons	
research-based	60%
pedagogical examples	25%
lecture	4%
no response	10%

The following table describes the thinking of those who feel that while alternatives are preferred, lecture is cost-effective. "Costs" were described very broadly here. By "lecture," respondents often mentioned that it was more effective use of class time (this was mentioned more explicitly in the "time" category). The "extra effort" category is self-explanatory and "pedagogical examples" means that they listed specific tools, like clickers (which may or may not have directly answered the question). Overall, this group seems concerned with the extra effort and time costs (both prep and in-class) of teaching with something other than lecture.

Question 7b: lecture is cost-effective—reasons	
lecture	36%
extra effort	24%
time	16%
pedagogical examples	10%
other	8%

The free responses to Questions 7a and 7b allow one to investigate how the respondents view teaching and learning (in this question they were asked why what they view as the best teaching method is appropriate). The following table breaks this down by categorizing responses. Here three categories are used; does the response best address "the teaching process," "the learning process" or "learning outcomes." The last two categories can be thought of as "student-centered" teaching. As can be seen, those who think that lecture is best think very differently about teaching than do those who think that alternatives to lecture are preferable. Those who feel that lecture is best focus on teaching and those prefer lecture alternatives predominately mentioned the learning process or learning outcomes.

Question 7a & 7b responses by category		
students learn best from	lecture	alternatives to lecture
teaching process	43%	2%
learning process	30%	78%
learning outcomes	2%	22%

The next table reports the percent of class time spent on "other learning activities: experiments, group activities, peer instruction, clickers, etc" sorted by how the respondents answer to how students learn best (#6). While those who

feel that alternatives to lecture are preferable use alternative more often, it is notable that they report spending only about 10% more class time on these activities.

Percent of Class Time Spent on "other learning activities" by views on how students best learn		
lecture best	13.4 (mean)	10 (median)
lecture cost-effective	13.7 (mean)	10 (median)
alternative preferred	24.7 (mean)	20 (median)

Next, a standard OLS regression model is used to further explore the factors that lead to greater use of alternative teaching methods. The following table shows the results; the dependent variable is the percent of class time spent on something other than lecture or discussion (the third option in Question 5). Dummy variables are used for Questions 1 and 2 as respondents answered just one of the options. The base case for Question 1 is the first entry (graduate students who have just been a TA) and for Question 2 it is for those whose institution offers an Associate's degree. For Question 6, the base case is students learning best from lecture. Question 3 simply uses the number of years of teaching experience and variables from Question 4 used a 1 for each type of training that they received and a 0 if there was no training. The independent variables' names are straightforward abbreviations from the survey and have the same order as in the survey.

OLS Model
Dependent variable: percent of class time on other learning activities

	Coefficient	Std. Error	t-ratio	p-value
const	28.3574	9.72074	2.9172	0.0038 ***
grad_stud_own_course	−14.3211	4.67269	−3.0648	0.0024 ***
non_tenure_track	−8.33236	4.61503	−1.8055	0.0722 *
tenured	−6.98343	4.70392	−1.4846	0.1389
untenured	−11.2008	4.40290	−2.5439	0.0115 **
bachelors	−13.9618	9.18883	−1.5194	0.1299
doctoral	−8.82513	8.47460	−1.0414	0.2987
masters	−11.9759	8.71406	−1.3743	0.1705
teach_years	−0.0945162	0.141537	−0.6678	0.5049
tr_grad_school	4.01494	2.49207	1.6111	0.1084
tr_informal_disc	−1.50113	2.49611	−0.6014	0.5481
tr_self_taught_onj	3.54063	2.61505	1.3539	0.1769
tr_self_taught_pub	0.680359	2.89831	0.2347	0.8146
tr_on_campus_works	−2.52385	2.61888	−0.9637	0.3361
tr_TTP	7.09503	3.57584	1.9842	0.0483 **
tr_other	4.69203	2.89432	1.6211	0.1062
lect_cost_eff	0.998265	3.01388	0.3312	0.7407
alts_preferred	10.1697	2.79609	3.6371	0.0003 ***

As can be seen, few variables are assocaited with the percent of class time spent on non-lecture, non-discussion methods of teaching. Grad students teaching their own course is negatively associated with this dependent variables and the coefficient itself is relatively large. At the 5% level or less, untenured faculty have a negative association, while TTP participants have a positive association with a relatively large coefficient. Finally, those who say that they felt that students learned best with alternatives also have a positive association with the independent variable with a fairly large coefficient.[k]

[k] It would be unusual if this variable was not significant and large as it would indicate that instructors did not act consistent with their beliefs.

Mean dependent var	17.79818	S.D. dependent var	19.27273
Sum squared resid	84645.11	S.E. of regression	18.14823
R^2	0.168304	Adjusted R^2	0.113289
$F(17,257)$	3.059234	P-value(F)	0.000067
Log-likelihood	−1178.008	Akaike criterion	2392.015
Schwarz criterion	2457.117	Hannan–Quinn	2418.143

OLS Model
Dependent variable: percent of class time on other learning activities
Heteroskedasticity-robust standard errors, variant HC3

	Coefficient	Std. Error	t-ratio	p-value
const	28.3574	10.1676	2.7890	0.0057 ***
grad_stud_own_course	−14.3211	7.49092	−1.9118	0.0570 *
non_tenure_track	−8.33236	7.50175	−1.1107	0.2677
tenured	−6.98343	7.66184	−0.9115	0.3629
untenured	−11.2008	7.47853	−1.4977	0.1354
bachelors	−13.9618	6.74048	−2.0713	0.0393 **
doctoral	−8.82513	6.33581	−1.3929	0.1649
masters	−11.9759	6.66398	−1.7971	0.0735 *
teach_years	−0.0945162	0.123387	−0.7660	0.4444
tr_grad_school	4.01494	2.43112	1.6515	0.0999 *
tr_informal_disc	−1.50113	2.55052	−0.5886	0.5567
tr_self_taught_onj	3.54063	2.52265	1.4035	0.1617
tr_self_taught_pub	0.680359	2.89873	0.2347	0.8146
tr_on_campus_works	−2.52385	2.54205	−0.9928	0.3217
tr_TTP	7.09503	3.54613	2.0008	0.0465 **
tr_other	4.69203	3.07795	1.5244	0.1286
lect_cost_eff	0.998265	2.88281	0.3463	0.7294
alts_preferred	10.1697	2.94773	3.4500	0.0007 ***

Mean dependent var	17.79818	S.D. dependent var	19.27273
Sum squared resid	84645.11	S.E. of regression	18.14823
R^2	0.168304	Adjusted R^2	0.113289
$F(17,257)$	3.590955	P-value(F)	4.18e–06
Log-likelihood	−1178.008	Akaike criterion	2392.015
Schwarz criterion	2457.117	Hannan–Quinn	2418.143

There is evidence of heteroskedasticity in the residuals of this model, which can lead to errors in the standard errors. To correct for this, the HC3 correction was run and the results are in the above table. As can be seen, at the 5% level the results are similar, though not identical. At this level, graduate students teaching their own course becomes a bit less statistically significant while those who teach at a bachelors-level institution does become significant. However, TTP training and believing that students learn best with alternatives stayed significant at this level.

These OLS results suggest that there are relatively few variables associated with teaching with alternatives. The ones that stand out are TTP training, believing in alternatives, and perhaps teaching at at bachelors-level institution.

To summarize this section, it appears that those who feel that lecture is the most effective instructional method are not very familiar with the pedagogical literature. For those who feel that lecture is an inferior instructional method but nonetheless cost effect, time costs (both coverage and prep time) are leading rationales. On factors that impact actual class time on alternative methods, believing that this approach is superior and TTP training have a positive association.

5 Conclusion

The above data suggest that those who prefer lecture not only act differently than those who prefer lecture alternatives, but they also view teaching differently. This is puzzling as there is abundant pedagogical material on implementing active learning and other research-based instructional strategies for those willing to look. A recent search on Google Scholar of "active learning college" yielded 64,600 results. Certainly not all of those are relevant, however of the top ten, seven appear intended to guide an instructor in the pedagogy and the other three could indirectly encourage an instructor by describing the beneficial results of using RBIS.[l] [m]

There is also material available for purchase. A search of the same key words on Amazon.com yielded 162 results just under the category "Education and Reference." Again, many are not relevant, but many are, with the most popular being *McKeachie's Teaching Tips: Strategies, Research, and Theory for College and University Teachers*. (Svinicki and McKeachie, 2011) now in its 13th edition.

There is also plenty of literature on using alternative teaching methods in economics courses specifically. A Google-Scholar search of "'active learning' economics" generated 21,700 results. Of the top ten, nine appear to describe how to incorporate some form of active learning into an economics course.[n] There are also many books on teaching college economics available on Amazon.com and elsewhere, including *Teaching Undergraduate Economics: a Handbook for Instructors* by William B. Walstad and Phillip Saunders (1998), *Teaching Economics: More Alternatives to Chalk and Talk* edited by William E. Becker, Michael Watts, and Suzanne R. Becker (2006), and the *International Handbook on Teaching and Learning Economics* edited by Gail Hoyt and KimMarie McGoldrick (2012).

Perhaps the above material simply speaks to those already familiar with teaching with alternatives. Thus, maybe some sort of outreach might be in order. Perhaps one approach is the publication of more papers that empirically find that alternative lead to better student learning in economics. Apparently in physics many vigorous discussions took place after the publication of (Hake, 1998).[o] Economics has only a few papers that show lecture alternatives lead to more learning and perhaps more would increase the prominence of these ideas. There are suggestions above that economists act on their teaching beliefs (those who felt that alternative lead to better learning actually lectured less) so perhaps this approach could be fruitful.

For those who find lecture inferior, but cost-effective, continued development of sites like *Starting Point* should be encouraged. With pre-packaged materials, the time and prep costs of teaching with non-lecture methods can be

[l] On 15 October, 2012, the practical guides were: Meyers, C, and TB Jones. 1993. Promoting Active Learning. Strategies for the College Classroom; Bonwell, CC, and JA Eison. 1991. "Active Learning: Creating Excitement in the Classroom" in ASHE-ERIC Higher Education Reports; Silberman, A. 1996. Active Learning: 101 Strategies To Teach Any Subject; Johnson, DW, RT Johnson, and KA Smith. 1998. Active Learning; Sutherland, TE, and CC Bonwell. 1996. Using active learning in college classes: a range of options for faculty; Millis, BJ, and PG Cottell Jr. 1997. Cooperative Learning for Higher Education Faculty. Series on Higher Education; and Huba, ME, and JE Freed. 2000. Learner centered assessment on college campuses: Shifting the focus from teaching to learning.

[m] On 15 October, 2012, the pedagogical results were: Anaya, G. 1996. "College Experiences and Student Learning: The Influence of Active Learning, College Environments and Cocurricular Activities" in Journal of College Student Development; Braxton, JM, JF Milem, and AS Sullivan. 2000. "The Influence of active learning on the college student departure process: Toward a revision of Tintos theory" in Journal of Higher Education; Johnson, DW, RT Johnson, and KA Smith. 1998. Active Learning; and Prince, M. 2004. "Does active learning work? A review of the research" in Journal of Engineering Education.

[n] Simkins, SP. 1999. "Promoting active-student learning using the World Wide Web in economics courses" in Journal of Economic Education; Bean, JC. 2011. Engaging ideas: The professors guide to integrating writing, critical thinking, and active learning in the classroom; Sivan, A, RW Leung, C Woon, and D Kember. 2000. "An implementation of active learning and its effect on the quality of student learning" in Innovations in Education and Training International; Crowe, D, and J Youga. 1986. "Using writing as a tool for learning economics" in Journal of Economic Education; Elliott, C. 2003. "Using a personal response system in economics teaching" in International Review of Economics Education; Johnston, CG, RH James, JN Lye, and IM McDonald. 2000. "An Evaluation of Collaborative Problem Solving for Learning Economics" in Journal of Economic Education; Schank, RC. 1994. "Active learning through multimedia" in Multimedia, IEEE; Salemi, MK. 2002. "An illustrated case for active learning" in Southern Economic Journal; and Maier, MH, and D Keenan. 1994. "Teaching tools: Cooperative learning in economics" in Economic Inquiry.

[o] This is a foundational paper in physics education research with more than 2,100 citations as of May, 2013.

reduced. With this and the above mentioned measures, it might be possible to increase the number of economists who use more effective teaching methods.

2012 SURVEY on TEACHING PRINCIPLES

1) **Which best describes you:**

- ☐ graduate student (TA experience only)
- ☐ graduate student (has taught own course)
- ☐ non tenure-track instructor
- ☐ tenure-track instructor without tenure
- ☐ tenured instructor

2) **What is the highest degree offered by your institution?**

☐ Associate's ☐ Bachelor's ☐ Master's ☐ Doctoral

3) **How many years have you been teaching Principles (Macro, Micro, or combined)?** _____

4) **Which best describes your training to teach? (mark all that apply)**

- ☐ formal pedagogical training in graduate school
- ☐ informal discussion with superiors or colleagues
- ☐ self-taught with on-the-job experience
- ☐ self-taught with published or on-line pedagogical materials
- ☐ on-campus workshops and training
- ☐ Teacher Training Program (TTP) Workshops (affiliated with the AEA)
- ☐ other workshops, training, or conferences

5) **Over the semester, how do you allocate class time? (sum to 100%)**

- _____ lecture-based instruction
- _____ instructor-lead discussion
- _____ other learning activities: experiments, group activities, peer instruction, clickers, etc.

6) **In your view, overall,**

- ☐ students learn best from lecture. (Please jump to 7a.)
- ☐ students do not learn best from lecture, but it is cost-effective. (Please jump to 7b.)
- ☐ students do not learn best from lecture, so alternatives are preferred (Please jump to 7a.)

7a) **In your view, why do students learn best this way?**

7b) **In your view, what specific costs to the alternatives make lecture cost-effective?**

Thank you for your time!

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