

# **Student Performance in Flipped Classrooms: Evidence from an Upper Division Research Methods Course**

By

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## *Abstract*

This paper presents the results of an in-class assessment of progress toward meeting course objectives in an upper division undergraduate social science research methods class. The course is a flipped classroom, where students are tasked with developing an individual research project, designing and apply a quantitative empirical methodology for evaluating hypotheses, and assessing the results. They are expected to present their progress as numerous points in the classroom as well as assist their peers during the process. While the course typically earns high performance ratings from students on university-deployed assessments, few measures have been developed to measure student progress toward the primary learning objectives of the course. A survey instrument was developed based on nine objectives established for the course based on Bloom's taxonomy of learning objectives. The survey was deployed at the beginning, middle, and end of the semester. The results showed statistically significant improvement along most course objectives, although progress was not uniform or universal. Statistically significant improvements were found in the students' ability to identify and develop testable hypotheses, conduct academic literature reviews, identify and apply an appropriate empirical methodology, conceive and implement a major research project, assess the policy implications of their research, and engage with their peers. While improvements were found in the student's reported confidence in their ability to give oral presentations and present written reports, the results were not statistically significant. Moreover, students appeared to make the most significant progress during the first half of semester. The paper concludes with recommendations for improving course content, potential applications to other courses and contexts, and identifies directions for future research.

## **1. Introduction**

Measuring performance and outcomes in college classrooms is problematic, suffering from measurement problems. Universities and colleges typically develop and deploy course evaluations to students, but the survey suffer from aggregation problems. Wide variations in teaching approaches, student self-selection, and course objectives undermine the utility of these surveys in terms of assessing instructor performance as well as evaluating learning in the classroom. Increasingly, institutions of higher education are implementing peer assessments of teaching to provide direct feedback. However, peer assessments vary significantly based on the knowledge and teaching philosophies of the the instructors. Yet a third approach is for instructors to develop and deploy learning assessments to students in the classroom based on course objectives.

This paper examines the results of using an in-class survey instrument to evaluate student progress toward course objectives. The course was an upper division undergraduate research methods course designed to prepare students for the development, deployment, and application of a research study in a professional environment. While the methodology prevented a direct assessment of learning, the survey provided important insight into student progress over the course of a semester in a course with specific pedagogical objectives geared toward academic preparation at the end of an undergraduate career.

The next section provides an overview of the course, its demographics, its objectives, and pedagogy. Section Three the survey design and methodology for deployment in the classroom. Section Four discusses the results based on survey deployments during the first week of class, a mid-point in the semester, and the last week of the semester. Section Four discusses directions for future assessments and the general applicability of the tool for classroom assessments for learning.

## **2. Upper Division Research Methods Course**

ECP 4618 is an upper division course in research methods with a focus on urban economics, housing, and land use. In 2011, the course content, although not focus, was revisioned as an applied quantitative methods workshop more aligned with professional workplaces and demands. As a result, the emphasis of the course work shifted to independent research, oral presentations, collaborative discussions on methods and interpretation, research design, and deeper understanding of fundamental principles of statistical analysis. In short, the classroom was “flipped,” eschewing exams and quizzes in place of developing a practical working knowledge of how to conceptualize and implement research projects. The course follows a workshop structure, where students are expected to do most of their work outside of class, produce deliverables at specific milestones, and reserve the classroom time for is problem solving and resolving project management issues. The instructor provides continual feedback to

individual projects as well as address larger questions and issue in a discussion based format throughout the semester.

As an elective course in the economics major, and most students tend to be economics majors, the course has typically drawn from a wide range of disciplines, including International Affairs, Entrepreneurship, Interdisciplinary Social Sciences, and Political Science. The only prerequisite is a college level course in statistics. Course enrollments have varied from 21 to 54, with average enrollment of 35 comprised mostly of junior and senior social science majors. During the Fall 2018 semester, 32 students were enrolled in the course. Sixty percent were seniors and another 21.9% were juniors. Twenty six (81.2%) students majored in economics, business, finance, or real estate. Other majors included international affairs, criminology, music, and interdisciplinary social studies. Just seven students (21.9%) were women.

## **2.1 Course Design**

A final objective of the research methods class is to introduce students to the process of conceiving and implementing a major research project. The assignments, tasks, and discussions are geared toward emulating a professional work environment by emulating a public policy think tank and providing students with practical experience in all phases of this task. Classroom content and activities address the core components necessary for conducting a major research project in a policymaking environment. Students are required to take leadership role on their projects and conduct independent research, including

- Identifying of a research topic and specifying hypotheses suitable for quantitative analysis
- Conducting and drafting a review of academic and expert research on their chosen topic
- Framing a methodology for determining the scope of data collection
- Identifying an estimating model
- Collecting and analyzing data using standard software capable of performing quantitative statistical analysis (e.g., excel, STATA, SAS, SPSS, R, GRETL, etc.)
- Presenting and interpreting the empirical results
- Preparing a final paper/report summarizing the project, the empirical results, and steps for future research.

Specific assignments are used as milestones and designed to complement professional practice and are cumulative in nature. For example, by identifying a topic and specifying testable hypotheses, students are given a structure to their research and identifying the appropriate professional literature to review. Their literature review exposes them to the “state of knowledge” on their topic and introduces them to data and common research methods, allowing them to create an empirical framework or methodology that identifies key independent and dependent variables. Their methodology presentations provide feedback that direct their data collection and use of statistical programs (e.g., excel, SAS, GRETL, Stata) to test their hypotheses. The presentation of their preliminary results provides real time, dynamic feedback that allows them

to conduct further research and write up their final paper (which includes revisions to their academic literature review and methodology paper as separate sections).

Typically, the instructor is the primary discussion leader during the class periods leading up to the oral presentations on methodology. During the methodology and preliminary results presentations, most of the discussion time is left to students to ask questions, probe the presenter on methodology, and for the presenter to solicit feedback on core questions from his peers. The instructor typically provides written feedback on the presentation with a grade based on a rubric. The comments and grades are returned to students during the following class period, so they have real-time guidance and feedback from the instructor. The instructor's verbal feedback is reserved primarily to offset incorrect information that might emerge during discussions (or presentation) and provide clarity on further research and interpretation of statistical methods. Table 1 outlines the milestones and progress students are expected to achieve as they complete the tasks leading to their final research paper.

<b>Table 1: Critical Assignments, Milestones, and Benchmarks for ECP 4618</b>		
<b>Assignments</b>	<b>Milestones (weeks)</b>	<b>Cumulative Progress Toward Project Completion</b>
Write out a testable hypothesis	2-3	10-15%
Writing and submitting for instructor comment and review an 8-10 page academic literature review	4	25%
Submission of 2-3 page methodology paper and oral presentation with powerpoint, including dedicated time for Q&A from students and the instructor	5 through 9	60%
Orally presenting preliminary empirical results using powerpoint including dedicated time for Q&A from students and the instructor	10 through 14	90%
Submitting a final research paper following academic convention and structure	Week 15	100%

## 2.2 Course Objectives

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The course and instructor have received positive feedback through the regular university run course evaluation process since the course was repurposed in 2012. For example, 93.8% of students responding to the Fall 2018 online course evaluation (61.3% response rate) reported they “strongly agreed” or “agreed” that the class requirements “accurately measured what I learned in the course,” “encouraged me to think critically,” resulted in “a great deal” of learning, and the course “stimulated my interest in the subject matter.”

Nevertheless, this feedback says little about whether the students accomplished the course objectives. The feedback is gathered at the end of the class without a well established baseline of knowledge or expectations at the beginning. While course syllabi provide written objectives, whether students improve in their ability or understanding of these objectives, let alone how to apply them in a professional setting, cannot be determined.

The ECP 4618 syllabus was revamped in the Fall 2018 to incorporated nine core objectives based on Bloom’s Taxonomy of learning objectives. Given the upper division focus of the course, the objectives tended toward “higher levels” of cognition and understanding, emphasizing analysis, evaluation, synthesis, and application.

The course objectives were reviewed in class during the first week of the semester and defined in the course syllabus (handed out and available on-line) with a qualification about expectations about behavior and approach to the course content:

*If you apply yourself diligently in this course, take advantage of the resources and opportunities made available to you, and stay focused on the course’s tasks, you should be able to do the following by the end of the semester:*

- *Identify and formulate a testable research hypothesis;*
- *Conduct an academic literature review on a research topic and synthesize relevant trends for your topic;*
- *Organize data, identify appropriate empirical methods, and apply these methods to analyze your data and test your hypothesis;*
- *Conceive, explain, organize, and implement a major research project;*
- *Effectively and constructively engage with your peers, fellow researchers, and experts to assist you (and assist them) in formulating, developing, and implementing a research project;*
- *Effectively and clearly present your research and results through oral presentations;*
- *Evaluate the practical public policy implications of your research;*
- *Identify, outline, and propose next steps for continuing research on your topic or in your area of research.*
- *Effectively present your research in written form.*

### **3. Survey Design & Purpose**

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In order to fill the void provided in the online course evaluation, a survey was developed to assess student progress toward the course objectives. While an objective method is problematic--the workshop format embeds multiple, organic, and incremental improvements in the quality of project base on individual student progress and knowledge--student confidence in their ability to meet the objectives is both measurable, tangible, and meaningful from a pedagogical perspective. Verbal surveys of students conducted at the beginning of each class--a matter of practice to establish early baselines--repeatedly revealed student knowledge of statistics is rudimentary at best, have no experience writing academic literature reviews, have little working knowledge of how to develop working hypotheses, and rarely report engagement in quantitative research projects using multiple regression analysis (the core empirical technique used in economics). Thus, the prospect of conceiving a research project of their own choosing, developing testable hypotheses, developing a framework for testing the hypotheses, implementing the project framework, and writing up the methods and results in a final research paper is daunting.

The survey was designed to determine student's perceptions of their ability to meet the course objectives, and implicitly work comfortably in a professional environment requiring the use of empirical tools and techniques. Each survey question was mapped over a course objective (see Appendix A). The survey was deployed on the Monday of the first week of classes after the drop-add period had closed. Twenty-eight students returned surveys (implying four enrolled students were absent from class). The same survey was deployed midway through the semester (on a Wednesday during Week 10) during oral presentations on project methodologies (and after literature reviews and methodology papers were turned in). Eighteen students returned surveys during this class period (implying a 56% attendance rate). The same survey was deployed for a final time during the last formal class period during Week 16. Twenty-two students returned surveys at this time (implying 68% attendance). Notably, this date was still prior to the due date for their final paper. Given the cumulative nature of the learning, students often don't see "the dots connect" until the final revisions of their paper, suggesting self-reported confidence levels for some students could still be lower than if they were surveyed after they completed their final paper.

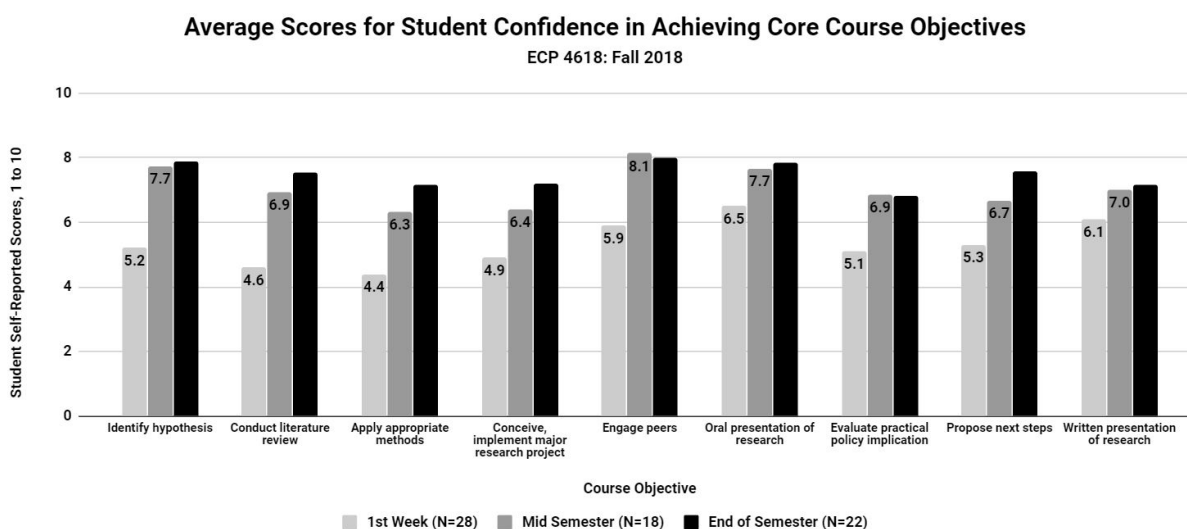
Notably, this particular semester was marked by several major disruptions to academic and campus life--a major hurricane in October and an off-campus mass shooting that apparently targeted FSU women in November. Nevertheless, the surveys allowed for the establishment of a baseline, a mid-semester estimate of progress, and an end of semester assessment. Seventeen students responded to all three surveys. Twenty-nine percent of the respondents were women even though women made up just twenty-two percent of the enrolled students in the class.

#### **4. Survey Results**

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Overall, the student self-reports showed significant improvement in their confidence to perform the tasks identified as core components of ECP 4618 (Figure 1). Students believed their ability to identify a testable hypothesis scored just 5.2 at the beginning of the class, but rose to nearly 8 by the end of the class. Their confidence in their ability to conduct an academic literature review also increased dramatically. Almost all objectives demonstrated improvement over each benchmark. The only exceptions were the confidence in their ability to engage their peers, and their confidence in their ability to evaluate practical policy implications from their research. Even these scores, however, are higher than where they started. The relatively low progress in confidence in identifying the policy implications of their research might be influenced by the fact most students had yet to finalize their final projects and write their conclusions based on the empirical results of their project. Most progress appeared to occur early in the class.

**Figure 1**



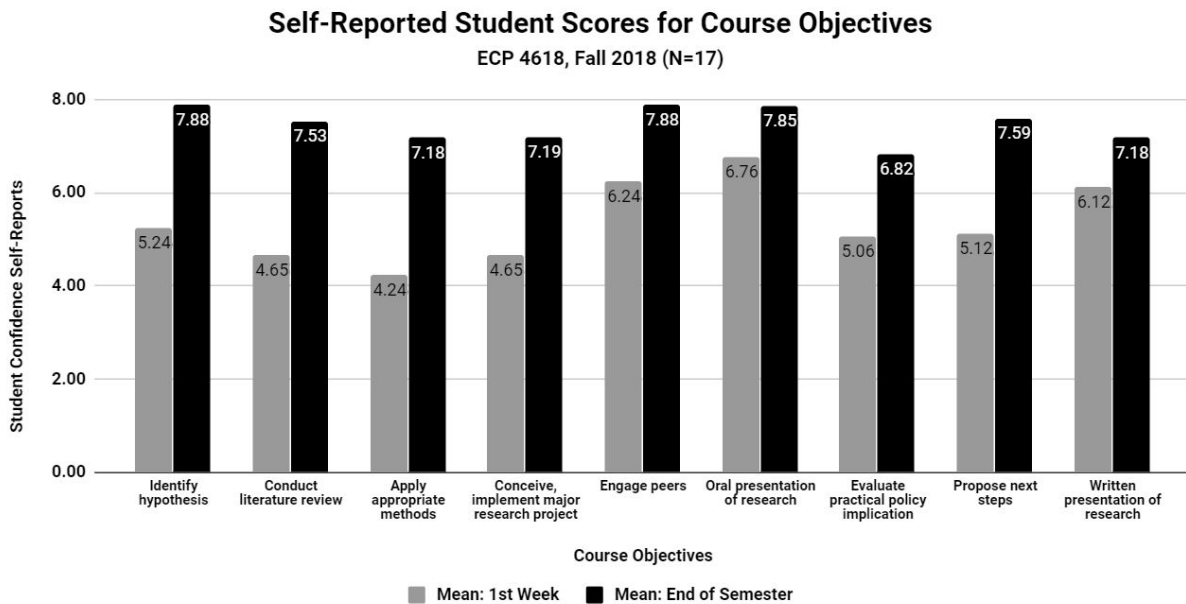
Course Objective	Numerical Change	Percent Change	Standard Deviation
<i>Identify and formulate a testable research hypothesis</i>	2.65	50.7%	3.57
<i>Conduct an academic literature review on a research topic and synthesize relevant trends for your topic</i>	2.88	62.1%	3.08
<i>Organize data, identify appropriate empirical methods, and apply these methods to analyze data and test a hypothesis</i>	2.94	66.1%	2.59
<i>Conceive, explain, organize, and implement a major research project</i>	2.12	43.6%	3.08

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<i>Effectively and constructively engage with my peers, fellow researchers, and experts to assist them in formulation, developing, and implementing a research project</i>	1.76	29.8%	3.36
<i>Effectively and clearly present my research and empirical results through oral presentations</i>	1.09	16.8%	2.82
<i>Evaluate the practical public policy implications of my research</i>	1.76	34.6%	2.66
<i>Identify, outline, and propose next steps for continuing research on my topic or in my area of research</i>	2.47	46.2%	2.66
<i>Effectively present my research in written form</i>	1.06	17.4%	3.11

These results draw from different samples of the student population. The surveys were then culled to include only those students that completed the first and third rounds of the survey, leaving a cohort of 17 students. These students also showed significant progress along the major course objectives (Figure 2).

**Figure 2**



A two-tailed test of means found that improvements were statistically significant with a 98 percent confidence level (two tailed test) in their confidence to:

- Identify a testable hypothesis
- Conduct a literature review
- Apply appropriate empirical methods



- Conceive and implement a major research project
- Evaluate practical policy implications of their research

Students were more confident in their ability to engage their peers at the 95 level of confidence.

Improvements in their confidence to present their research in oral and written forms were not statistically significant.

## **5. Implications for Pedagogy**

The survey provided an important tool for evaluating student progress in achieving the core objectives of ECP 4618. The flipped classroom approach seemed to dramatically improve students' confidence in their ability to perform along critical dimensions of the professional workplace, which is increasingly reliant on even junior workers to conduct independent work and engage professionally with their peers and mentors. Although these results reflect just one cohort and a small sample size, future applications of the survey can help more fully evaluate the robustness of the pedagogy.

Perhaps more importantly, the survey has also identified areas for improvement in the classroom beyond what could be gleaned from standard university course evaluations. The lack of statistically significant improvements in oral presentations skills and written communication indicates that more attention should be given to these elements of the class. In particular, more frequent instructor feedback as well as a greater emphasis on revisions to written projects may improve student confidence along these dimensions.

## **References**

Anderson, L., Krathwohl, D., & Bloom, B. (2001). *A taxonomy for learning, teaching, and assessing : a revision of Bloom's taxonomy of educational objectives* (Complete ed.). New York: Longman.

## Appendix A

### Professional Skills Confidence Survey

Survey milestone (circle): Week1                      Mid-Semester                      Final Week

FSU ID: \_\_\_\_\_ (for statistical identification purposes)                      Date:

Year in college:                      1st yr                      2nd yr                      3rd yr                      4th yr

Major (primary): \_\_\_\_\_                      2nd major/minor: \_\_\_\_\_

Please score the following statements on a scale of 1 to 10, with 1 being I am not confident at all to 10 being I believe I could perform these tasks in a professional work setting.

Today, given my current academic background and experience, I would rate my confidence in my ability to,

1. Identify and formulate a testable research hypothesis: \_\_\_\_\_
2. Conduct an academic literature review on a research topic and synthesize relevant trends for your topic: \_\_\_\_\_
3. Organize data, identify appropriate empirical methods, and apply these methods to analyze data and test a hypothesis: \_\_\_\_\_
4. Conceive, explain, organize, and implement a major research project: \_\_\_\_\_
5. Effectively and constructively engage with my peers, fellow researchers, and experts to assist *them* in formulating, developing, and implementing a research project: \_\_\_\_\_
6. Effectively and clearly present my research and empirical results through oral presentations: \_\_\_\_\_
7. Evaluate the practical public policy implications of my research: \_\_\_\_\_
8. Identify, outline, and propose next steps for continuing research on my topic or in my area of research: \_\_\_\_\_
9. Effectively present my research in written form: \_\_\_\_\_