

Stepping around the Brick Wall: Overcoming Student Obstacles in Methods Courses

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How can we as teachers of methods design specific classroom techniques to facilitate learning (and avoid frustration) among students? This is especially important given that we know students lack enthusiasm for quantitative methods and have little specific knowledge related to quantitative methods when they enter our classrooms (2006 APSA T&L Track Summary). In this paper, we contribute to the scholarship on teaching methods by exploring common undergraduate student barriers to learning quantitative research methods and then reviewing professor solutions to these barriers. Using a multi-method approach, we survey students and professors to understand common obstacles to learning methods and provide an analysis of one assessment technique.

Background

Methods courses are increasingly mandatory for a liberal arts education (see, for example, Wahlke 1991, Quaile Hill 2002, Chronicle of Higher Education 2003, APSA T&L Summary 2006). More and more, students are required to conduct a research project from start to finish either when enrolled in a research methods course or an advanced seminar or when completing senior thesis projects. Given that students are asked more frequently to conduct research, it is imperative that teaching tools take into account the struggles *students* perceive.

There is a sense of agreement among instructors regarding several standard components of a methods course, including: “An understanding of key political science indicators; where to find literature and supporting data; how to assess literature and the supporting data’s academic quality; reliability and validity; the use of appropriate statistical measures; data presentation skills.” (APSA T&L Track Summary 2006). However, teachers of methods sometimes disagree on ways to teach these components and utilize a variety of different means to communicate these concepts (APSA T&L Track Summary 2006). The political science scholarship of teaching and

learning on research methods often reveals general approaches and specific assignments used to achieve student learning (e.g., Cole 2003, Corrigan et. al. 2006) and highlights the subsequent benefits students experience as a result of these efforts (e.g., Andersen and Harsell 2005).

What seems to be missing in previous work is an identification of major obstacles students of all learning styles face throughout the research process and a discussion of the solutions that instructors develop in course projects, assignments, and in-class exercises which minimize these barriers.

In this paper, we identify and discuss problem areas for students at various stages of the research methods course, comparing student problems with professor perceptions of student problems and how teaching strategies might minimize these barriers. Our multi-method approach is composed of three main prongs. First, we survey students in methods courses to identify barriers to student confidence in the following areas: finding and assessing literature, coming up with a research question, choosing appropriate sampling and measurement, performing relevant statistical analyses, and presenting data. Next, through a comprehensive survey of research methods professors, we identify ways in which professors can – and do – attempt to address these student barriers when they design their courses, projects, assignments, and in-class activities. Finally, we provide an assessment from our own course as a model for evaluating the success of overcoming student barriers. We conclude with a discussion of some research methods course “best practices” that emerged from this research.

Methods

Student Barriers

The first component of our research is to understand what barriers *students* perceive to their success in the research process. To answer this question, we surveyed students enrolled in

two *Quantitative Methods* courses and one *Honors Quantitative Methods* course at the University of Minnesota – Twin Cities. This course is not required for the political science major at this university; however, the course does fulfill a mathematics requirement for the College of Liberal Arts. Moreover, students who are interested in completing an *optional* concentration in one of several sub-disciplines of political science have the choice to take this course (as one of many) towards three of those different concentrations. Thus, not only do the students enrolled in these courses come from a variety of backgrounds and abilities but they also need not be political science majors.

We gave short questionnaires for the course instructors to administer to students near the beginning of the term. Forty-nine students completed the questionnaire. We asked two sets of questions. First, given a list of aspects of the research process, students designated which parts they had experience with prior to their enrollment in this course, shown in Table 1. Next, in answering an open-ended question, students wrote what concerns they had regarding completing each aspect of the research process, shown in Tables 2 through 8.

Professor Perceptions of Barriers and Their Solutions

Our second approach to study the “best practices” of teaching methods led us to examine what *teachers* of methods think are the barriers to students in the research process. Further, we investigate how those teachers design their courses to overcome these obstacles. To answer these questions, we surveyed teachers of methods courses and asked them to hypothesize what barriers students face. Respondents also shared their instructional solutions to address potential student barriers. In order to examine the content of and assignments used in quantitative analysis courses, all faculty respondents were asked to submit their quantitative methods syllabi.

To sample these professors, we obtained a list of four-year institutions from the Carnegie Foundation (Carnegie Foundation for the Advancement of Teaching 2006). We drew a random sample of 100 four year colleges and universities, eliminating schools that did not have a four year political science degree. We then searched the websites of the identified schools to identify either a professor of methods or a department chair to whom we could send an email invitation for the study. We sent each person in our sample one introductory letter and, if they did not respond, we sent up to two reminder emails. The data were collected on surveymonkey.com, which is an online data collection bank. Our response rate was 50%, with 50 methods professors responding. Nine respondents submitted their syllabi and course assignments.

Our respondents have been teaching methods in political science for an average of 5.33 years. Seventy-three percent of respondents indicated a methods course is a formal requirement in their department's curriculum. We also asked respondents to indicate what course they teach methods in. Twenty-five percent indicated they teach "Scope and Methods", 26% teach research design, 31% teach quantitative analysis and 14% teach a senior capstone. In Tables 2 through 8, we summarize the most popular responses to the questions of specific concerns of students, comparing it to the barriers professors think students have (described in the next section). More detailed results are presented below.

Student Assessment

Methods courses should, in fact, reduce student fears and increase students' confidence in their ability to succeed at every step in the research process. As professors, part of our job is to make sure that we are measuring not only student learning but also our success in overcoming students' perceived barriers. In addition to the data described thus far, we present an additional method to evaluate student learning personally used in one of our methods courses (Schneider).

At the beginning of the semester, students were given a survey with each of the goals for the class, including defending their view on the use of human subjects; creating and testing a research question; choosing, evaluating, and implementing a research design; sampling technique, and research method; analyzing data; assessing results; giving a presentation; and finally, their ability to succeed in a more advanced statistics course. For each course objective, the students indicated how confident they felt in their ability to perform such a task on a four-point scale, from 1 being “Not at all Confident” to 4 being “Extremely Confident.” At the conclusion of the semester, students were given this same form and again indicated how confident they felt in their ability to complete the course goals. We compare the responses from the beginning and the end of the course.

Results

As any methods professor can probably predict, students were very unfamiliar with the quantitative aspects of the research process. Specifically, as shown in Table 1, just about half of the students had some experience with social science research questions, literature searches, assessing the quality of academic literature, and giving a presentation. However, significantly less than half of the students had any experience with sampling, measurement, and statistical analyses, crucial components for completing a research project. The students in the honors section of the course had slightly more experience with the quantitative aspects of the research process, but not noticeably more than their peers in the non-honors section.

When asked to describe the first two or three concerns that came to mind for each aspect of the research process, several students’ comments reflected their lack of familiarity with the process. Comments such as, “I’ve never done this before so I wouldn’t know where to start,” and “don’t even know what that means” were littered amongst the more specific concerns of

students. To further analyze and quantify the student comments, we developed a list of broader categories and classified comments into one of those categories (See Tables 2 through 9).

In the following sections, we will discuss the barriers to students for specific aspects of the research project, the perceptions of professors regarding what the barriers are for students, and the solutions those professors use in their classrooms in an attempt to overcome the barriers for students.

Coming up with a social science research question

Nearly all professors (94%) believe in the importance of teaching the development of a social science research question. While almost a majority of students say that they have had experience in this area, most faculty estimate that 20% or fewer students come to their courses with some prior instruction in this area. All but one of the syllabi we coded devoted a portion of the course to research question development.

When faced with the task of coming up with a social science research question, the number one barrier to students was developing a question that is clear and/or specific. The breakdown of percentages can be found in Table 2. A few comments that highlight this point are that students wanted their topic to be “specific enough,” “clear and concise,” and “precise.” Students’ next concern regarded the uniqueness of their question. They want a topic that “hasn’t already been asked” and is “original.” Other barriers of note include students’ own realization that they are not familiar with asking social science research questions or they lack experience in this area. Students also want to ensure that they are interested in the topic, that the topic is important and feasible, and finally, that the topic is “neutral” or “unbiased.”

While the professors do not vastly differ from the students in their perceptions of barriers that students face, there are some noteworthy differences. First, students mentioned the

uniqueness of their project more often as a barrier than professors did. This suggests that professors are underestimating the student concern that a project needs to be completely new and different in order for it to be good.

The second difference is that students were more concerned with the feasibility of the project (i.e., what types of resources do I need in order to complete this research and where can I find those resources). Professors likely have a better automatic understanding of the feasibility of student projects and the scope of their expectations for the project. Thus, the professors' understanding of feasibility might explain the student fears on this point where the professors lack recognition of this fear. Professors were mainly concerned with student inexperience with social science. These comments include concerns about coming up with a question that is explanatory and empirical, rather than descriptive, and thinking conceptually about causality.

The primary solution that professors used to solve the fears and barriers of students was with examples – typically, by breaking down good (or bad) research questions for the class to contemplate. Many professors shared application problems for homework or in-class assignments where students actively read and pick out the research or causal questions.

Literature Review

While over three-fourths of professors (84%) said that this topic is an important one to teach, only two of the seven syllabi we coded included a portion on literature reviews. Granted, students have more experience with this aspect of the research process than almost any other area. Fifty-five percent of students claim prior familiarity with this topic and the professors' estimate concurs with this claim.

Students' main concerns with the literature review process reflected the difficulty of sorting through the plethora of sources, displayed in Table 3. Students were mainly concerned

with finding *good* sources (37%), *enough* sources (10%), and deciding how to navigate through *too many* sources (4%). Another concern of students was to find unbiased sources (10%), a slightly unusual statement that may reflect their inability to assess the academic quality of literature, discussed fully in the next section. Professors were more concerned with the students' inability to connect the literature to the research question (12%) and the students' general unfamiliarity with literature searches (28%). Importantly, professors indicated that students do not seem to know what constitutes an appropriate source, which is reflected by a difficulty with deciding to go to the library or do research on the internet and differentiating between academic and popular literature.

The main solution to the fears associated with literature reviews is instruction – visits to the library, presentations by librarians, and demonstrations of JSTOR and other search engines. The second most popular solution to this problem was to have students demonstrate their understanding of a literature review by turning in an annotated bibliography.

Finding and assessing literature

Related to the difficulty of writing a literature review, students must assess the literature that they find. Again, while over three-fourths of the professors (84%) said that it was important to teach this topic, only one of the seven syllabi we coded actually included something about it. While the students felt as though they did have experience in this area (61%), the majority of the faculty disagreed, estimating that 20% or fewer of their students had experience in this area. Perhaps students are so unfamiliar with the topic that they are not even sure what it means. This theory is reflected in the students' comments regarding their concerns – the number one comment was a general unfamiliarity with this step (20%), followed by having no concerns (8%), concerns about peer review (8%), and finally concerns about bias (6%). Again, the

concern with bias is an unusual one – students were concerned that the research that they find might have a particular “agenda” instead of being truly scientific. Faculty mainly identify that the students lack the knowledge, experience, and skills to navigate through academic literature. To solve this problem, they again turn to instruction from the librarians and general “rules of thumb,” such as identifying the top journals for the students, and telling them about peer-reviewed articles. Few professors use examples and application in this area.

Choosing appropriate sampling

One key topic covered in most quantitative methods courses is sampling design. Of the syllabi reviewed for this paper, 75% explicitly listed sampling methods as a course topic. Similarly, 69% of faculty surveyed stated that teaching sampling concepts was “very” or “extremely” important in methods courses. The faculty surveyed perceived student experiences with sampling procedures very accurately (see Table 5). That is, 82% of faculty surveyed estimated that 20% of students in their courses had experience regarding sampling techniques. Twenty-four percent of students surveyed indicated they had some experience with sampling concepts.

Common student barriers cited by faculty included a lack of quantitative skills and knowledge related to probability and sampling. Students, however, reported barriers related to more global concerns such as how to choose an appropriate design, what types of designs are feasible, relevant, or representative. Students note things like “making sure the sampling design is appropriate for the question” and “making sure the sampling design is attainable within the allotted time.” Both students and faculty shared the concern that students lack experience with and confidence regarding their skills in choosing a sampling design. It seems as though the mathematics involved with sampling is not perceived to be as large of barrier for students as we

as faculty may perceive. In addition, a surprising number of faculty mention that they “don’t do this” in their course, that the topic is “not applicable for their course” and that it’s simply “beyond most of their students.”

Faculty respondents offered several useful ways in which they teach sampling concepts. Typical instructional topics included: probability, different types of sampling techniques, target population, representativeness, and bias. Several faculty members mentioned using small group discussions of examples or scenarios in class to help students work through how to apply different sample designs. Many respondents reported requiring homework assignments whereby students create a specific sampling design.

Choosing appropriate measurement

Teachers of methods tend to agree that it is important for students to understand what statistical measures are appropriate and whether those measures are reliable and valid (APSA T&L Track Summary 2006). In fact, 90% of faculty surveyed indicated it is “very” or “extremely” important to teach measurement concepts. Faculty perceptions of student experience with measurement are very accurate. Among faculty in our sample, 78% of faculty estimated 20% or fewer of the students in their courses would come into the course with any familiarity with measurement. Similarly, 27% of student respondents report that they had some previous exposure to measurement prior to enrollment in their political science methods course.

Every syllabus reviewed for this study explicitly mentions measurement as a course topic. However, only 38% of syllabi reviewed mention explicit coverage of concepts of reliability and validity. These instructors, however, may be covering reliability and validity concepts under the broader umbrella topic of measurement.

Faculty and students largely perceive the same student barriers with regard to measurement (see Table 6). Both faculty and students indicated barriers such as knowing what types of measures exist, understanding reliability and validity, and understanding which measure is appropriate in a given research situation. Students made comments such as “because there are so many methods you can use to measure, it’s difficult to decide which are most effective” and “making sure I’m measuring what I actually intended to measure.”

In certain areas, faculty and student perceptions differ: the professors perceive a student barrier in having requisite mathematical skills and knowledge of measurement concepts. For example, faculty comment that “numbers scare them,” “the math again,” and “They often have difficulty understanding how something can be measured, and what the limits of various measures are.”

No students mentioned such concerns.

Those faculty surveyed mention numerous techniques to convey to students concepts related to measurement. Common themes in instructional topics included: discussing reliability and validity, measurement, and operational definitions. One faculty person highlights the value of asking students to operationalize variables in real life before asking them to think about applying measurement concepts to politics. Faculty tended to stress using a variety of measurement examples in class, including having students examine measures used in articles. A variety of analytic homework assignments focusing on measurement were discussed, including assignments where students choose measures for various concepts and assess the quality of measures.

Performing relevant statistical analyses

There is somewhat of a divide among faculty with regard to whether our methods courses should in fact teach students to actually perform relevant statistical analyses. Sixty-seven percent of faculty responded they find it “very” to “extremely” important to teach this in their courses. Faculty seemed to indicate that it is simply too difficult to get past research design in order to have students meaningfully participate in data analyses. Further, as evidenced in the syllabi reviewed, many methods courses cover numerous types of methods leaving less time for instruction in performing quantitative analyses.

The main concern students held with regard to performing analyses of data was that they might misinterpret their findings. For example, one student respondent states “misinterpreting data, making sure that the data is causal and not confounded by another variable.” Both faculty and students perceive barriers regarding math or statistics phobias and questions surrounding how to determine what analysis is appropriate. Common themes in the comments included “terror of math,” “hard to not get lost in the numbers,” and “how do I know which analysis to use?” Table 7 summarizes the distribution of faculty and student responses.

Numerous faculty offered ideas as to how they instruct students with regard to performing analyses. They suggested things like instructing students to do analyses by hand in class or giving students detailed handouts regarding types of analyses and types of data situations. Most faculty require students to complete assignments requiring application and have students participate in weekly labs where they demonstrate techniques which students then practice.

Presenting data

Another goal teachers of methods share is to help students gain the necessary skills and practice presenting data (APSA T&L Track Summary 2006). Approximately 70% of faculty respondents in our survey indicated they find it “very” or “extremely” important to include presentations in their courses. Having students present in class, and specifically data they have analyzed, is critical because it demonstrates their deepened understanding of exactly what their data mean. However, only 25% of the syllabi reviewed require students to present their analyses.

When asked what barriers they perceive with regard to presenting, student respondents replied that they were concerned about whether their conclusions were correct, whether they would be disproved in the question and answer time, and whether their presentation would be boring for their peers. Students noted comments like “making sure my data isn’t flawed and fear of criticism of my data,” “being unable to answer questions. Be disproved in front of others,” and “knowing how to present information with clarity so people are not bored or confused.” Faculty perceived that students lack the skills to effectively use visual aids, saying things like “lack of powerpoint skills” and “keeping their overheads or powerpoints focused.”

Both faculty and students shared concerns regarding confidence in presentation skills, whether they could convey statistics appropriately, whether the presentations would be clear, and that students would fear public speaking in general. The distributions of content in student and faculty perceptions regarding data presentations are detailed in Table 8.

Faculty perceptions, for the most part, were correct. However, it seems faculty could do more to increase students’ confidence in presentations beforehand. For example, students could exchange presentations prior to giving them to generate questions for one another to be asked during the presentation. Also, faculty could hold a conference with each student to review their

conclusions and statistical analyses to give students extra confidence. Students could, in that meeting, try to informally explain their data analyses.

Numerous faculty respondents offered suggestions as to how to instruct students to give effective presentations. One faculty member suggests, “I provide students with an example of how I present my own research at a conference, so they can see what it should look like. I also provide them with clear guidelines in terms of organization, length, and type of statistical material that they should discuss in their presentation.” Another faculty person gives a research presentation from his/her own research a few weeks in advance so the students know what to expect.

Student Assessment

Assessment of students’ pre- and post-course confidences in specific abilities can help measure whether we have overcome these barriers for students. To assess our achievement in overcoming student barriers, we analyze students’ pre- and post-course confidence ratings (see Table 9) with regard to performing various aspects of the research process (e.g., ability to create and test a research question, ability to analyze data using relevant statistical analyses, etc.).

While there may be many specific questions that we could ask students (i.e., whether or not they had learned something in this area, etc), we felt that asking students how confident they felt in their ability to achieve these tasks would be a good way to determine if we had overcome their fears and barriers associated with these tasks. Indeed, we find that students were significantly more confident in their ability to create and test social scientific hypotheses, to choose an effective research design, to analyze data using relevant statistical analyses, to assess results, and to describe and defend their research in front of their peers. These results suggest that

incorporating some type of assessment tool in our class can help us determine whether or not we are successful in overcoming student barriers.

Discussion and Conclusions

Our results suggest several concrete ways in which methods professors might improve their courses to better address student barriers. First, methods courses do not seem to mimic all of the “necessary” components to the research process put forth by the APSA T&L Track (2006). Most noticeably absent from the syllabi we received were a literature review section, assessment of academic literature, and student presentations. If our goal is for students to understand and perform all aspects of the research process, we must give them the tools to accomplish each task.

In numerous areas there is a remarkable divide between what methods professors agree are important course content (e.g., APSA 2006 T&L Track Report) and what is explicitly covered in methods courses. We are surprised by how many instructors in our sample state that they do not cover sampling. Also, among syllabi reviewed, only about one quarter mention a course focus on reliability and validity concepts. Similarly, numerous faculty respondents indicate that they do not have their students perform statistical analyses in their courses. Few courses in our sample required student data presentations.

Second, there appear to be several disparities between students’ actual fears and what professors consider the fears to be. Specifically, students have many more fears about uniqueness of their projects and research questions. Faculty who do not recognize this fear may not give their students the tools to overcome this in their assignments and course instruction. How we as political scientists come up with a unique research project may be a useful component to a course or perhaps acknowledging the fear without confronting it head-on might be more effective given the sheer number of topics and time limitations. Also, students admit

they have difficulty in determining the feasibility of a project in the confines of a course or a project period. In courses where students are doing a project, we can help students with their fears by addressing the feasibility of their specific project. In terms of literature review – finding and assessing literature – students seem to be overconfident in their abilities. Yet, they still have trouble navigating through the system of sources. Moreover, they cite “bias” as an area of their concern. To the extent that we can give them good shortcuts on literature searches and a good definition of what bias means in terms of social science, we can alleviate these fears.

With regard to sampling, faculty overestimate student fears regarding math in this area and did not identify the more global student concerns regarding conceptual things like how to identify if a sample is representative. With regard to measurement, a similar divide emerges. Faculty overwhelmingly perceive math as a large student barrier. Students again mention more global concerns like knowing what measures exist and how to choose the appropriate ones. Faculty might better address the more global concerns students have by incorporating more exercises for students to gain confidence in each area. It is only in the case of analyzing data where both faculty and students finally agree that math is a huge barrier.

Students report they are very experienced with class presentations. The barriers they shared were often missed by faculty: questions regarding the unique challenges regarding presenting data (e.g., are my analyses/conclusions sound? will I be disproved in front of my peers? how do I describe my results?). If we require students to present their data, we must give special attention to guiding them through the process.

Again, since the goal of our courses is to make sure that students leave our course with not only a good understanding of research, but also the ability to contribute to research, assessment is a “must.” Not only do we need to assess student learning (i.e., through exams and

projects), but we also need to assess how confident students feel in their abilities, to make sure that their fears are alleviated. In this paper, we present one way to measure whether or not our teaching methods have addressed the student fears and improved their confidence in their methods abilities.

If the goal of a methods course is that at the end of the course, students should feel comfortable doing all of the steps of the research process on their own, then we as methods professors must take into account three things. First, we must understand what challenges and obstacles *students* perceive when they walk into our classroom that might inhibit their achievement of this goal. Part of this may be as simple as asking students more specific questions about their previous experiences and what barriers they perceive. Second, when designing our course activities and assignments, we must consider what types of activities might help students overcome these specific obstacles. And, finally, we must assess our course assignments and activities to make sure that our efforts were successful. Our conscious reflection regarding where our students lack confidence or skills can allow us to approach teaching methods in a more effective way. That is, by considering and assessing the ways in which our pedagogies may be at odds with student barriers, we can more effectively engage students in our methods courses.

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Table 1: Student Experience with the Research Process

Which of the following aspects of the research process have you had any experience with prior to this course? (Check all that apply).

	49 Students
Devising a social science research question	49% (24)
Doing a literature search	55% (27)
Assessing the academic quality of literature	61% (30)
Choosing an appropriate sampling design	24% (12)
Choosing appropriate measures	27% (13)
Performing relevant statistical analyses	35% (17)
Presenting data to an audience of your peers	51% (25)

Table 2: Barriers in the Research Process: Social Science Research Question

	49 Students	50 Professors
Clarity/Specificity	27% (13)	16% (8)
Uniqueness	22% (11)	4% (2)
Feasibility	18% (9)	6% (3)
Inexperience with Social Science	18% (9)	28% (14)
General Inexperience	12% (6)	10% (5)
Importance	8% (4)	6% (3)
Interesting to Student	8% (4)	6% (3)
Neutrality	4% (2)	0% (0)
Student Lack of Interest in Social Science	0% (0)	4% (2)

*Note that percentages can add to more than 100 because of multiple mentions.

Table 3: Barriers in the Research Process: Doing a Literature Search

	49 Students	50 Professors
Finding Good Sources	37% (18)	6% (3)
General Unfamiliarity	14% (7)	28% (14)
Finding Enough Sources	10% (5)	8% (4)
Unbiased Sources	8% (4)	0% (0)
Time Consuming	8% (4)	6% (3)
Internet Research vs. Library Research	6% (3)	14% (7)
Connecting Source to Argument	6% (3)	12% (6)
Finding Too Many Sources	4% (2)	4% (2)
None	2% (1)	0% (0)
Referencing Sources	2% (1)	2% (1)
Academic vs. Popular Literature	0% (0)	16% (8)

*Note that percentages can add to more than 100 because of multiple mentions.

Table 4: Barriers in the Research Process: Assessing Academic Quality of Literature

	49 Students	50 Professors
General Unfamiliarity	20% (10)	2% (1)
None	8% (4)	0% (0)
Peer Review	8% (4)	2% (1)
Bias	6% (3)	0% (0)
Time Consuming	6% (3)	0% (0)
How To Determine Quality: General	6% (3)	14% (7)
Lack Knowledge/Experience/Skills	4% (2)	32% (16)
Undergraduates Simply Do Not Do This	2% (1)	2% (1)
Not Required in my Class	0% (0)	4% (2)

*Note that percentages can add to more than 100 because of multiple mentions.

Table 5: Barriers in the Research Process: Sample Size

	49 Students	50 Professors
Representative/Generalizable/Lack of Bias	16% (8)	4% (2)
Feasibility	12% (6)	0% (0)
Relevant to Research Question/Hypotheses	10% (5)	2% (1)
Sample Size	8% (4)	2% (1)
What to Consider/What is Appropriate	8% (4)	2% (1)
Lack of Experience/Confidence	6% (3)	2% (4)
None	4% (2)	0% (0)
Not Required in my Class	0% (0)	14% (7)
Lack Knowledge/Experience	0% (0)	12% (6)
Lack Reasoning/Probability/Math Skills	0% (0)	10% (5)

*Note that percentages can add to more than 100 because of multiple mentions.

Table 6: Barriers in the Research Process: Measurement

	49 Students	50 Professors
Determining when a Measure is Appropriate	8% (4)	4% (2)
Misc.	8% (4)	4% (2)
Lack of Experience/Confidence	6% (3)	12% (6)
Reliability/Validity/True Response	6% (3)	4% (2)
Knowing Types of Measures/Data	4% (2)	6% (3)
Ease/Difficulty of Measuring	4% (2)	0% (0)
Relevant to Research Question/Hypotheses	2% (1)	2% (1)
Bias	2% (1)	0% (0)
None	2% (1)	2% (1)
Measurement Concepts/Numbers	0% (0)	14% (7)
Conceptualizing	0% (0)	4% (2)

*Note that percentages can add to more than 100 because of multiple mentions.

Table 7: Barriers in the Research Process: Statistics

	49 Students	50 Professors
Choosing Analyses Appropriately	12% (6)	8% (4)
Understanding Data/Measures	10% (5)	4% (2)
Misinterpretation	10% (5)	0% (0)
Fear of Numbers/Statistics	10% (5)	22% (11)
Understanding Analyses	6% (3)	2% (1)
No Experience/Confidence	6% (3)	6% (3)
Analysis Programs	4% (2)	2% (1)
None	2% (1)	6% (3)
Concepts of Statistics	0% (0)	6% (3)

*Note that percentages can add to more than 100 because of multiple mentions.

Table 8: Barriers in the Research Process: Presentation

	49 Students	50 Professors
Clarity/Organization	12% (6)	12% (6)
Overall Project Quality	12% (6)	0% (0)
Conveying Statistics	10% (5)	4% (2)
Fears about Public Speaking	8% (4)	16% (8)
Keeping Audience Attention	8% (4)	0% (0)
Skills Related to Public Speaking	8% (4)	4% (2)
None	8% (4)	6% (3)
Answering Questions	6% (3)	0% (0)
Presentation Visuals	0% (0)	8% (4)
Not Applicable	0% (0)	4% (2)

*Note that percentages can add to more than 100 because of multiple mentions.

Table 9: Assessment of Learning

Before the term began, students were asked to evaluate their confidence in their ability to perform the following tasks on a four- point scale from Not Confident at All (1) to Extremely Confident (4). At the end of the term, they were asked to complete the same self-evaluation.

	Pre-Term	Post-Term
<i>Defending</i> my view on the use of human subjects in social scientific research	2.89 (.758)	3.61* (.502)
<i>Creating</i> and <i>testing</i> my own, well-formed, social-scientific question using quantitative methods	2.50 (.857)	3.78* (.428)
<i>Choosing, evaluating, and implementing</i> a research design, sampling technique, and measurement method	2.44 (.185)	3.67* (.485)
<i>Analyzing</i> data using relevant statistical analyses	2.72 (.826)	3.44* (.616)
<i>Assessing</i> results, critiquing both research design choices and initial research question	2.61 (.698)	3.61* (.608)
<i>Applying</i> statistical knowledge by <i>assessing</i> statistics in the media	2.61 (.698)	3.56* (.511)
<i>Describing</i> and <i>defending</i> research in front of peers	3.00 (1.029)	3.56* (.616)
<i>Succeeding</i> in a more advanced statistics class	2.11 (.900)	3.17* (.786)

Note: Entries are means with standard deviations in parentheses

*Mean difference is significant at a $p < .05$ level