

**Student Self-Assessment in an Undergraduate Research Methods Class:
Implications for Learning and Teaching**

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ABSTRACT. Although courses in basic research methods are standard in undergraduate social science programs, there is a dearth of research on effective research methods teaching strategies. This study used student self-assessment to explore what sources of scientific information students relied on, as well as their confidence in interpreting scientific studies at the beginning and end of an introductory research methods course. Self-assessments were also used to see how students learned about survey research methods. Findings suggest students are more likely to seek scientific information from academic sources, to know the definition of the word “empirical,” and to be more comfortable designing surveys at the end of a research methods course than at the beginning. Students did not find critiquing a survey particularly useful in learning about survey design, but did find the instructor’s lecture slides most useful. There is discussion of implications for using self-assessment as a research methods teaching strategy.

Keywords: teaching research methods, undergraduate research, student self-assessment

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Introduction

Scientific research methodologies are central to understanding and influencing human behavior, but many undergraduate students enter research methods courses with misconceptions, fears, and lack of enthusiasm about learning methodologies essential to the social sciences. How students come to know information, and how they change their minds based on information, are important for research methods educators to understand. Student self-assessment can provide research methods educators with increased information about their students and has potential to give students increased insight about their own knowledge, beliefs, and gaps in understanding with regard to scientific methodologies.

This study, conducted by an instructor who teaches an undergraduate research methods course, examined thoughts and beliefs students had when they began a research methods course, and how these changed (or did not change) after taking a semester-long research methods course. The study examined how students understand and use scientific and non-scientific information before and after taking a Human Development and Family Science research methods class. Although some students will go on to be researchers as part of their professional work, many will not. All students, however, will need to interpret information and determine whether it is valid, meaningful, and useful as they move throughout their lives. Ideally, research methods courses play a role in helping students become savvy consumers of information.

The study investigated thoughts and beliefs students have when they begin an undergraduate research methods course, how these change over the course of the semester, and how conducting self-assessments influenced student awareness of their own thoughts, beliefs, and behaviors in relation to research methods and scientific inquiry. In addition to investigating initial student self-assessment and change in self-assessment over the course of the semester, the study explored how using a self-assessment survey as a way to provide hands-on learning activity for students might be effective for student understanding of research methods concepts. The study identified changes in (a) sources in which undergraduate students seek scientific information, (b) students' understanding of basic research concepts, and (c) students' confidence in reading and writing scientific papers. The findings extend current knowledge about what students know about scientific methodologies before taking a research methods class and provide faculty key information about how students' understanding changes during a semester. This research also examines how self-assessment surveys can be used as teaching tools over the course of a semester.

Background

Courses in research methods are part of the standard curriculum in most undergraduate and graduate level social science courses. However, when instructors search for strategies and

pedagogical theories for how to teach research methods effectively, many soon realize that research about teaching research methods in the social sciences is minimal.

Recognizing this, Garner, Wagner, and Kawulich (2009) edited the book *Teaching Research Methods in the Social Sciences* in an attempt to begin building “pedagogical culture” (p. 2) with regard to teaching research methods. By contrast, the apprehensions and struggles with which students face statistics classes are much better represented in the literature. Statistics and research methods courses are often required for undergraduate students, and they often build on one another sequentially, with students not permitted to take a research methods course until they have successfully completed a statistics course. This reinforces the need for clear guidelines on research methods instruction.

A particular problem facing statistics and methodology courses is lack of student interest and confidence. Griffith, Adams, Gu, Hart, and Nichols-Whitehead (2012) found that 61% of Psychology majors and 57% of Criminal Justice majors had positive attitudes related to their statistics courses, whereas 70% of Business majors had positive attitudes. The authors conclude that in addition to having instructors who may be outside the student’s field of interest (e.g., having a math faculty member teaching a statistics course instead of a psychology faculty member), students who believed they would not use information they were learning in class for graduate school access or in their careers were less likely to engage positively with course material. Those of us who teach in majors where students often have applied and clinical aspirations should realize that students may struggle to see why and how information in statistics and research methods courses are relevant to their goals.

Beyond not having clear understanding of why they have to learn research methodologies and statistics, students might also arrive in courses with anxiety about their content. In fact, such worries are so ubiquitous that there are scales designed specifically to assess students’ attitudes, feelings, and beliefs about statistics. Examples of such scales include *Statistics Attitude Survey* (SAS) (Roberts & Bilderback, 1980), *Attitudes Toward Statistics* (ATS) (Wise, 1985), and *Survey of Attitudes Toward Statistics Scale* (SATS) (Schau, Stevens, Dauphine, & del Vecchio, 1995). These negative attitudes and anxieties about statistics are associated with poorer learning outcomes (Perepiczka, Chandler, & Becerra, 2011), which indicates that statistics pedagogy needs to address such factors.

In a peer-reviewed follow-up to their 2009 book, Wagner, Garner, and Kawulich (2011) reviewed 195 articles from 61 journals that discuss teaching of research methods. Along with identifying seven themes related to the teaching of methods in the social sciences (including a lack of information on how to teach research methods generally), the authors identify three gaps they believe the social sciences need to address empirically: “1) the role and desirable characteristics of a research methods teacher; 2) the challenges of teaching and learning specific aspects of research methods; and 3) commonalities and differences in research methods between disciplines” (p. 82). In the years since this article’s publication, researchers have started to address these gaps and investigate social science research methods teaching strategies and to connect what is known about student attitudes toward statistics courses to research methods courses. Despite these efforts, however, many gaps remain.

Markle (2017) found that student self-perceptions about math ability influenced their perceptions of learning in undergraduate research methods courses. Specifically, students who believed that being successful in research methods courses meant they also needed to be good at math reported lower levels of perceived learning in their undergraduate research methods courses. Other researchers have addressed issues of student apprehension directly, finding success in using collaborative methods with students (Macheski, Buhrmann, Lowney, & Bush, 2008; Walsh & Weiser, 2015) or in techniques that use technology (like classroom-flipping) (Bartolic, 2016) for teaching about research in the social sciences.

The present study aims to contribute to the “pedagogical culture” (Garner, Wagner, & Kawulich, 2009, p. 2) of research methods in the social sciences and to begin filling the gaps about knowledge, beliefs, and thoughts students bring to research methods courses, how specific teaching strategies influence their learning, and how they change in terms of where they access information over the course of a semester. Student self-assessment is a relatively simple tool to engage students in inquiry about their levels of understanding or experience and can give students information on their own knowledge, beliefs, and opinions regarding specific topical areas (Ambrose, Bridges, Lovett, DiPietro, & Norman, 2010). This study also aims to determine if student self-assessment with regard to scientific research changes after participation in a research methods course and explores the self-assessment survey as a research methods teaching tool. This approach can provide us with useful information about the understandings and beliefs of incoming undergraduate research methods students in the social sciences, along with insight into how research methods courses influence student self-assessment in relation to use and understanding of scientific research.

Methods

The overarching goals of this study were to (a) examine knowledge, thoughts, and beliefs students have when they begin an undergraduate research methods course, and to see how knowledge, thoughts, and beliefs do or do not change after taking a semester-long course designed to expose students to basic scientific methodologies and research evaluation; and (b) examine how conducting student self-assessments might provide students with increased insight about their own knowledge, beliefs, and gaps in understanding with regard to scientific methodologies. It was hypothesized that students would report lower levels of understanding about scientific methodologies at the beginning of a research methods course than they would at the end. It was also hypothesized that students would rely more on non-scientific sources for information before taking a research methods course than after. Exploring these hypotheses provides research methods instructors with insight about their students when they arrive in their classrooms. This is not only a vital aspect of creating a “pedagogical culture” (Garner, Wagner, & Kawulich, 2009, p. 2), but can also guide and enhance instructional methods to maximize learning of basic research methods techniques. Furthermore, exploring how student-self assessment influences learning is valuable not only for instructors as they work to provide appropriate and student-focused instruction, but is also important for students as they come to understand how they learn and how they work to critique information.

The Course and the Students

Participants were students in an introductory research methods course in a Human Development and Family Studies department. The course included students from class standings ranging from freshman to senior. However, the majority of students reported sophomore and junior class standing. Participants were recruited from the course during the Fall 2016 and the Spring 2017 semesters. The course, titled *Empirical Inquiry*, focused on introducing students to basic quantitative and qualitative methods used in the social sciences. The overall course objectives included teaching students to (a) identify and critique core concepts important to conducting research including research design, hypothesis formulation and testing, data gathering and analysis, report writing, and research presentation; and (b) create a research proposal including a review of existing scientific literature and outlining methods of an independent research study.

The course was taught using a lecture format enhanced with student discussion and activities. In addition to introducing basic methodologies, much of the course focused on finding, reading, and interpreting scientific information. Each student designed and presented a proposal for a research project as the final course project. To engage students in course material, the instructor provided opportunities to apply course concepts through course activities (e.g., after introducing basic terminology of sampling methods, an activity where students could identify sampling methods used in various research scenarios would be presented). Students also selected their own topics of interest to construct a literature review and study design to investigate this topic. Topic selection was student-driven to maximize student engagement and interest in applying new and technical research methods concepts.

The author was the instructor for the courses, which made student consent and anonymity particularly important. The instructor made it clear that student responses were not graded and that research study participation was optional. All students completed surveys for instructional purposes; however, students interested in having their responses used for purposes of this study offered consent. Surveys were filled out anonymously online using Qualtrics, without collection of participant names. Average age of student participants was 21.42 years ($SD = 2.32$). Six students identified as male and 18 identified as female ($N=24$).

The Survey

Students completed the *Research Methods Self-Assessment Survey* at the beginning and end of the semester. In the Fall 2016 semester, students completed the survey for the second time approximately 15 weeks after completing it the first time. In the Spring 2017 semester, the survey was completed for the second time approximately 14 weeks after completing it the first time. The *Research Methods Self-Assessment Survey* asked questions about where students obtained scientific information, what information influenced them to change their minds, their understanding about basic research terminology, and their comfort reading and writing scientific papers. The survey can be found in Appendix A.

The Survey Assessment Activity

During the course unit on survey design and assessment (offered in semester week 8 for Fall 2016 and in week 10 for Spring 2017), students were asked to critique the *Research Methods Self-Assessment Survey* they took at the beginning of the semester (found in Appendix A), identifying its strengths and weaknesses. As part of the class activity, students worked in pairs to evaluate the survey. Next, each group shared ideas with the entire class. After completing critiques and class discussion, student participants were asked to complete the *Learning about Survey Research Self-Assessment*, which assessed student perceptions of how they learned about survey design and research. The survey is available in Appendix B.

Results

At the beginning of the research methods course, students reported they were neither comfortable nor uncomfortable reading scientific papers (2.04, on a scale from 1=not at all comfortable to 4= very comfortable). By the end of the semester, students reported more comfort reading scientific papers (2.35), although this difference was non-significant ($t=-1.423$, $p=.162$). With regard to writing papers, students reported more comfort at the beginning of the semester (2.75, on a scale from 1= not at all comfortable to 4= very comfortable) than they were at the end of the semester (2.67), although this difference was non-significant ($t=.366$, $p=.717$). At the beginning of the semester, 25% of students reported they knew what the word *empirical* meant. However, 75% of students reported knowing the definition of the word at the end of the semester, a significant difference ($\chi=10.932$, $p=.001$)

Responses on where students heard about scientific research shifted after they took the research methods course. Figure 1 shows the percentage of students who reported hearing about scientific research across different categories.

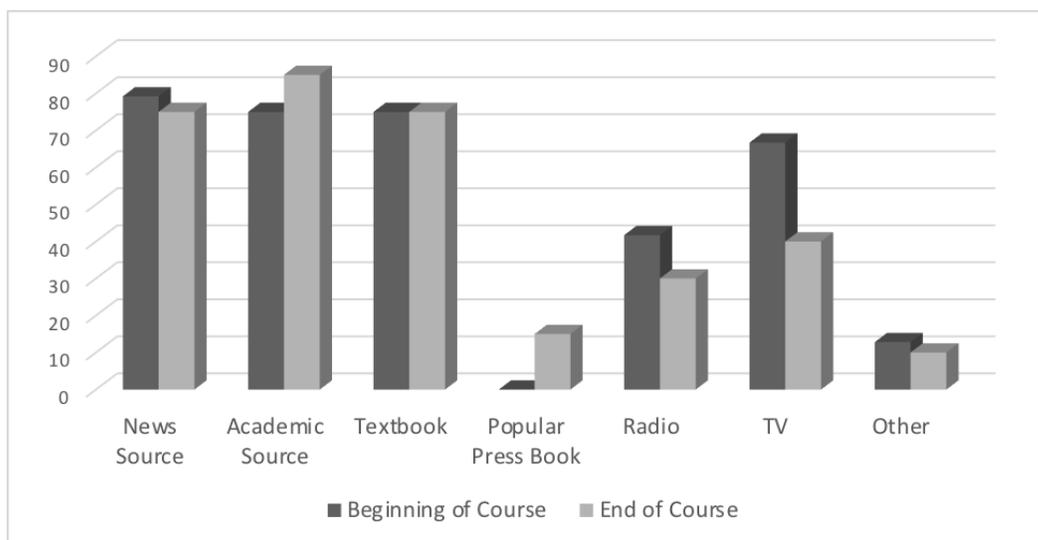


Figure 1. Where students hear about scientific research

To understand how reading empirical literature influences student learning of new ideas or challenges previously held beliefs, students were asked if they had ever changed their minds or opinions after reading a research paper or article. Before taking the research methods class, 83% said “Yes,” 8% said “No,” and 8% said they were unsure. At the end of the research methods class, 90% said they had changed their minds or opinions after reading a research article, 5% said they had not, and 5% said they were unsure if they had.

Students did not find the survey self-assessment particularly useful in helping them understand survey design. Instead, they found the instructor’s lecture slides more informative (80% of participants reported class lecture slides were most helpful and 20% reported the survey self-assessment activity as most helpful). Furthermore, 85% of students reported being more comfortable designing a survey at the end of the semester than they did at the beginning of the semester. That said, students reported that the survey self-assessment was only a little helpful to them in their learning about how to construct surveys.

Discussion

Results of this study contribute to our understanding of what students know before taking an undergraduate research methods class, what they learn by taking the course, and how they experience specific teaching practices. This research specifically addresses the call by Wagner, Garner, and Kawulich (2011) to address the current gap in knowledge regarding “the challenges of teaching and learning specific aspects of research methods” (p. 82). By the end of the course, students were more confident in their definitions of *empirical* by the end of the course, more likely to turn to academic sources when seeking scientific information, and more comfortable with their abilities to design surveys. Providing key definitions, helping students understand, critique, and interpret scientific literature and information, and instruction on effective survey design were course objectives. These were also key elements of classroom instruction, discussion, and activity. Although this may seem trivial, increased knowledge of the word *empirical* is key not only because it is a basic term, but also because understanding the definition is important in comprehending processes of conducting research. The word was also included in the course title. Students reported that they found class lectures a more helpful resource in learning about how to design surveys than they found conducting a survey self-assessment activity, which suggests that although active learning techniques are often helpful, jumping into an activity might not be comfortable or useful for students with low confidence in the subject material.

The finding that students were more likely to turn to academic and scientific sources for information is encouraging, since there is evidence that people of all ages have difficulty determining sources and validity of information (Stanford History Education Group, 2016) in a world that relies so heavily on information from the Internet. An important outcome of research methods courses transcends acquisition of knowledge about specific methods. These courses facilitate student understanding of where information comes from, the ways information is acquired, and what motivated the investigation in a social context where the process is more difficult than ever. This study reinforces observations that (a) students are obtaining information

about scientific information from a variety of sources and (b) these sources may be more meaningful to them than a research methods course is. If research methods courses can increase student ability to critique information from a variety of sources relevant to their lives, this may enhance their engagement and motivation in such courses (Griffith, Adams, Gu, Hart, and Nichols-Whitehead, 2012).

Although the survey self-assessment activity was expected to facilitate deeper understanding of survey design, students did not report this outcome. Instead, they preferred the instructor's lectures. The self-assessment, however, was included as part of the lecture on survey development, so students may have not been able to disentangle perceptions of which piece of the course content facilitated their learning. Students may also have been accustomed to the instructor's lecture slides by the time the self-assessment activity was introduced, and perhaps the novelty of the activity was not as comfortable as the traditional course structure was. In the social sciences, use of self-assessment in research methods classes needs much more investigation as the field continues to expand the "pedagogical culture" (Garner, Wagner, & Kawulich, 2009, p. 2) of teaching research methods. Furthermore, although students' reporting of where they sought scientific information shifted over the course of the semester, they did not report becoming more comfortable with reading or writing scientific papers. This might have been because students learned how much energy and effort these endeavors require. Students may also have learned "how much they didn't know" over the course of the semester, which reflects the high demands of learning course content, enhancing critical thinking skills, and improving reading and writing skills in research methods courses.

Limitations

This study is limited by threats to internal validity and external validity; findings should be interpreted with caution. Primarily, the study relied on a small sample size because of small class sizes during the investigation period. The small, non-representative, convenience sample significantly limits the ability to draw general conclusions about effective teaching of research methods. Instead, these findings can advance the dialogue on how to effectively teach research methods to undergraduate students. The survey critique used before the *Learning about Survey Research Self-Assessment* also involved students critiquing the *Research Methods Self-Assessment Survey* they would respond to once more at the end of the semester. The course instructor explained this was a limitation and believes it was a useful teaching tool about the importance of administering post-tests that measure the same constructs as pre-tests do. However, this may have influenced the end of semester responses. Students may also have felt uncomfortable evaluating a survey their course instructor designed, which may have influenced their responses.

Students completed the *Learning about Survey Research Self-Assessment* survey on the same day they completed the survey critique activity. Therefore, students may not have had enough time to digest material they learned from the activity. It is also possible that the *Research Methods Self-Assessment Survey* critique was a too vague and general exercise. Perhaps students would have learned more about survey design from reviewing a survey with clearly identifiable mistakes and errors rather than general areas for improvement.

Recommendation for Instructors of Research Methods Classes

Research methods instructors can learn from the design, implementation, and results of this study in several key ways despite the study's limitations. Although every research methods course has a set curriculum to ensure student exposure to specific content areas, instructors need basic understanding of what students know when they start the course. This understanding can increase the instructor's understanding of what students already know and of what information they may lack, so that the instructor can clarify issues from the beginning. For example, only 25% of students in this study knew what the word *empirical* meant at the beginning of a course titled *Empirical Inquiry*. Without assessing this, the instructor would have wrongly assumed that all students understood the definition of the course title. Assessment allowed the instructor to address this knowledge deficit and enhance student learning.

Research methods instructors must recognize that students live in a world full of information that comes from a variety of sources. Oftentimes, students hear information about science through mainstream media and personal resources. If instructors are to teach students how to interpret and analyze information effectively, they must know where and how students obtain information. This information allows instructors to assess how much these sources of information influence student learning, beliefs, and opinions. Knowing where students begin their research methods studies allows instructors to meet students where they are and to train them how to become more informed scholars based on that starting point. Failing to acknowledge the starting point may lead to confusion among students and ineffective instruction.

Finally, engaging in student self-assessment provides research methods instructors and students with opportunities to see if they are achieving course objectives. For example, an instructor who aims to focus on helping students learn to interpret scientific literature can see whether students become more comfortable with or better at this skill over time. For students, engaging in self-assessment allows them to learn about their own processes of learning and to reflect on course materials and activities they found useful.

Conclusion

This study contributes to our understanding of what students bring to their research methods classes, how they learn while they are in them, and what they take away from the experiences. Students came to the research methods class with little confidence in their abilities to read and write scientific papers. They did not know the definition of the word *empirical*, which was part of the course title, and they obtained information from non-scientific sources. By the end of the semester, students had more confidence in their abilities to interpret scientific information, were less likely to turn to non-scientific sources for information, and they knew the definition of the word *empirical*. To facilitate development of young scientists, researchers and educators must continue exploring how their students come to know information and how teachers can best influence their learning in their classes. We must also continue to create a "pedagogical culture" (Garner, Wagner, & Kawulich, 2009, p. 2) where we use the methods we

value as social and family scientists to understand how we can best train our students in these methods.

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Appendix A

Research Methods Self-Assessment Survey

- 1) Age:
- 2) Class Standing (please check): (Freshman, Sophomore, Junior, Other)
- 3) Gender: (Male, Female, Non-Binary, Other)
- 4) Check off the kinds of places you have found out about scientific research:
 - a. News source (online or print)
 - b. Academic/scholarly journal
 - c. Textbook
 - d. Popular press book
 - e. Radio
 - f. Television
 - g. Other (please list): _____
- 5) Have you ever changed your mind or opinion after (check answer most like you):
 - a. reading or hearing someone else's opinion? (Yes, No, Unsure)
 - b. reading a research paper or article? (Yes, No, Unsure)
 - c. reading or hearing about a research study as reported in the news (TV, web, radio)? (Yes, No, Unsure)
 - d. reading a posting on social media (Yes, No, Unsure)
- 6) How comfortable are you with writing papers? (Not at all, A little, Moderately, Very)
- 7) How comfortable are you with reading a scientific paper? (Not at all, A little, Moderately, Very)
- 8) Do you know what the word "empirical" means? (please check) (Yes, No)
- 9) In your own words, describe what "research" is, and what it means to you.
- 10) Provide a definition for the word "empirical."

- 11) As a student, what is your greatest weakness?
- 12) As a student, what is your greatest strength?

Appendix B

Learning about Survey Research Self-Assessment

- 1) Which was most useful in helping you understand survey design (check one most like you):
 - a. Lecture slides
 - b. Textbook
 - c. Reviewing Self-Assessment Survey in class
 - d. Other _____
- 2) Did you learn how to construct a survey by reviewing the Self-Assessment Survey? (Not at all, A little, Moderately, Very much)
- 3) Do you feel more comfortable now than you did at the beginning of the semester designing a survey? (Yes/No)
- 4) How much did you enjoy critiquing the Self-Assessment Survey? (Not at all, A little, Moderately, Very much)
- 5) How could the Self-Assessment Survey in-class activity be improved in future semesters?