ARTICLE
Using Biographies to Illustrate the Intrapersonal and Interpersonal Dynamics of Science

Monica Mori and Susan Larson
Department of Psychology, Concordia College, Moorhead, MN 56562.

We describe using biographies in teaching a course about the intrapersonal and interpersonal dynamics of science, with an emphasis on the professional and personal experiences of women in science. In our course, Life of a Psychologist: Experiences of Women in Science, students examine biographies and scientific research written by female psychologists across the main research areas of psychology. Biographies by these female psychologists and research on the experiences of women scientists are used to highlight the intrapersonal and interpersonal dynamics of science. Intrapersonal dynamics refer to the changes that occur within a person, such as developing an identity as a scientist, having a voice, and achieving success. Interpersonal dynamics refer to exchanges between people, such as collaborating on research, mentorship, and balancing personal and professional lives. Qualitative data support using biographies in teaching about the dynamics of science. Suggestions for using biographies in other courses are provided.

Key words: biography, social context, social interaction, personal development, science, scientists, psychologists, psychology, women, pedagogy

Intelligent, knowledgeable, and *curious* were the most common words used to describe scientists by students (n=22) in our two sections of Psychology Research Methods. Other common words included *observant, meticulous,* and *passionate.* Surprisingly absent from this list were any negative characterizations or any references to the social context of science. The failure of our students to acknowledge the social context of science might reflect society's portrayal of scientists. For example, Gil Grissom from "CSI," a television show detailing the scientific basis of crime scene investigation, is portrayed as an intelligent scientist who most effectively solves problems independently and who is socially inept. This stereotype of "the lone scientist at the bench" is one that organizations are trying to dispel (e.g., Expanding Your Horizons www.expandingyourhorizons.org). The National Academy of Sciences (1995) publication "On Being a Scientist" argues that: "science is inherently a social enterprise – in sharp contrast to a popular stereotype of science as a lonely, isolated search for the truth." Dispelling this myth and realistically portraying the life of a scientist is the premise for our course, The Life of a Psychologist: Experiences of Women in Science, that we will describe in this article.

Course Description

The goals of our course are two-fold: one goal is to expose students to research in major areas of psychology and a second goal is to present students with the many facets of being a scientist, with emphasis on the particular challenges experienced by women in science (see Table 1 for a synopsis of topics covered). To achieve these two goals, students read about the professional and personal experiences of female psychologists and read their original research. We selected women based on their exemplary scientific contributions in the major research areas of psychology such as neuroscience, cognitive science, and developmental psychology. Our main mechanism for illustrating their personal and professional experiences was through biographical information obtained from e-mail correspondence.

Research Area	Neuroscience Cognitive Science Developmental Psychology Social Psychology Personality Psychology Gender Psychology
Interpersonal Dynamics of Science	Mentorship Collaboration Balancing professional & personal lives Affirmative action
Intrapersonal Dynamics of Science	Defining an identity Achieving success Having a voice

Table 1. Topics covered in the course, *Life of a Psychologist,* including the major research areas and the dynamics of science addressed.

This discussion-based course has been taught four times and is usually offered every second year. For this eight-week course, students receive two-credit hours in either Psychology or Women's Studies. Typically junior or senior Psychology majors or minors and occasionally Women Studies minors take this course. Enrollment has ranged from five to 12 students who are almost exclusively female students with little to no academic background in women's studies or women's issues.

This course is team-taught and both instructors actively participate in each class period. Weekly class periods last three hours. In a typical class period we profile one or two female psychologists who conduct research in one of the major research areas of psychology. We start with a review and discussion of a scientific article she wrote followed by a lecture that contextualizes the significance of her research. Following this, students examine women's

issues by reading and discussing a biography written by this female psychologist describing her professional and personal experiences. Other materials pertaining to women's experiences in science are also read and discussed (Table 2).

1.	Published Biographies/Autobiographies: Published biographical information includes profiles of Dr. Mamie Phipps Clark whose research was instrumental in desegregating American public schools (O'Connell & Russo, 1983), Dr. Ruth Simmons who is the first African-American President of an ivy-league university (Simmons, 1998), and Dr. Blossom Wigdor who directed the first Canadian program in gerontology (Beaveridge, 1990).
2.	Qualitative Studies of Scientists: There are many excellent published studies based on interviews of women across the sciences (e.g., Biology, Computer Science, Mathematics, Psychology). Their findings address the intrapersonal and interpersonal dynamics facing women scientists such as balancing personal and professional lives (Wasserman, 2000), defining success (Murray, 2000), engaging in research collaborations (Pinner Scott, 1990), and developing a professional identity (Murray, 2000).
3.	Descriptive Studies: Statistics describing the experience of women in science were obtained from the American Association for Women in Science (n.d.), the American Psychological Association (2000), and the Massachusetts Institute of Technology (1999).

Table 2. Readings on women's issues.

Students' grades are based on written assignments about course readings, a group project, a written and oral test, and class participation. The group project requires interviewing male and female academics about their professional and personal experiences and making a group presentation. The presentations highlight the challenges and rewards of an academic career and the variety of ways gender impacts these experiences.

Obtaining Biographies

Prominent female psychologists were asked questions over e-mail (Table 3) about the development of their career, challenges they experienced and issues facing women scientists, their experience with mentorship, and advice they would give to aspiring women scientists. We asked a dozen women who were either our acquaintances or friends to respond to our questions. We received seven responses that varied from one paragraph to, more typically, several pages in length. The women who responded spanned the full career trajectory from Ph.D. students to Professor Emerita and the main research areas of psychology.

While we were concerned about drawing general conclusions from biographies, themes emerged across biographies such as the struggle to maintain balance between professional and personal life and to gain respect from students and colleagues. A diversity of views was evident in, for example, how single and married women maintain personal identity. Also, women realized women's issues at different stages in their careers and reflected on the impact and importance of these issues differently. For example, one woman wrote, "When I began graduate school and was told by very well-meaning feminists that I had lived my life being disadvantaged by virtue of my gender I was clearly taken aback. That hadn't been my experience at all – my successes and failures never seemed to be related to my gender and I'd never even given such notions a thought." Another noted "I was not fully aware of discrimination until I entered central administration..." Overall we feel that the biographies we used are an effective method for highlighting general as well as unique experiences and they reflect a variety of perspectives on women' issues.

1.	How did you decide on a career in psychology and your area of specialization?
2.	What struggles did you encounter as a successful female researcher (e.g., issues you faced obtaining an education and a career, balancing a career and a personal life)?
3.	Were there mentors to guide you along the way? If so, what important insights, knowledge or advice did you gain from them?
4.	What issues do you see facing young students and researchers today and what advice would you give to female students choosing a career in psychology?

Table 3. Questions addressed in the biographies from female psychologists.

Interpersonal Dynamics

To illustrate the many facets of being a scientist, we focus on the intrapersonal and interpersonal dynamics that are part of science and affect all scientists. Intrapersonal dynamics refer to the changes that occur within a person, such as developing an identity as a scientist. Interpersonal dynamics refer to exchanges between people, such as collaborating on research. Emphasis is given to addressing how women in the sciences experience these dynamics. We use biographical materials as well as other required readings to emphasize these issues. Below we will discuss the dynamics we address in our course and include examples of how biographies are used to highlight these issues.

Science is very much a social enterprise, yet undergraduate students often do not have this appreciation and educators may fail to reveal this reality (National Academy of Science, 1995; Ramirez, 2003). Many of the topics in our course, Life of a Psychologist, address the importance of interpersonal dynamics in scientific progress such as communicating between co-investigators and research assistants, reporting research findings at conferences and in scientific papers, and reviewing the work of others (Pinner Scott, 1990).

Interpersonal dynamics also extend to collaboration and mentorship, social experiences essential to professional growth and development. Many of the women we profile addressed this issue as the following quotes from three different biographies indicate. "To get an academic job you need to do the obvious – very good research that gets published – and the less obvious – find connections and get the respect of people who are established in your chosen field." "Several people in my department have

served a mentor-type role with me… this is very important because no matter how good you are, you have to know how the system works in order to get funding to conduct your research." "You can turn to your women colleagues – those who have successfully negotiated the minefields – and learn with them how to find your way, make sure your needs are met, and feel good about yourself along the way."

Of special consideration is how work is valued and credited. For example, women's contributions may be underappreciated by members on the research team and by others in the academic community (Pinner Scott, 1990; Massachusetts Institute of Technology, 1999). This is highlighted in one woman's biography describing her experiences as an administrator. She said that she "saw the way that women's CVs can be misread to give credit to male co-authors – irrespective of whether the woman is first or other author."

Finding a mentor that can appreciate one's unique situation is important for support and guidance. This may be more difficult for female students because of a lowered likelihood for faculty to encourage, promote, and guide female students and the scarcity of women in some areas of science (Murray, 2000; Wasserman, 2000; Rosser, 2004; Paul, 2005). These factors can intensify the challenge of finding a mentor or a role model. One woman's biography reflected this experience by noting "There were only a few mentors to help me initially. At university, I had only one female professor during my entire undergraduate training. As a graduate student, I worked almost exclusively with men." This same woman notes, in reference to two women she knew later in her career, that "these were both women I respected tremendously as academics and who also showed personal attributes that were close to what I wanted to be… I doubt either realizes the importance she played in my development." Most of the female psychologists we contacted, however, did indicate that there were people along the way to provide some form of mentorship and noted the value of this relationship in guiding their careers.

A common challenge for all scientists is balancing professional and personal lives. For women decisions about if and when to have children exaggerate this challenge because the tenure clock often corresponds to women's biological clock (Wasserman, 2000). This point is addressed in a number of biographies and is reflected in the following quote, "I think one of the big issues facing women and it has been a problem for a long time is striking a balance between career and family. …finding the right time to start a family can be challenging." Given that women are often expected to be primary caregivers, caring for children may compromise continued professional accomplishment and success (Murray, 2000; Wasserman, 2000; American Society for Cell Biology, 2002). We are fortunate to have a number of biographies address this issue from multiple perspectives. One woman writes: "I began my first job as an assistant professor when I was seven months pregnant...I was not entitled to maternity leave because I had not been at the university long enough. So the first year was very difficult. I brought my baby into work with me while I was getting my lab set up but it was not an ideal arrangement." Another woman provided a wonderfully detailed example of how she and her husband shared childcare responsibilities over the years, and how parenting responsibilities affected her career decisions. Some selections from her biography include: "The challenges of balancing first school, and later an academic position with two children were huge. You simply cannot know in advance how you will react emotionally, and you have to be flexible to ensure that your needs as a parent and as an academic are met… We (my husband and I) took turns for about 15 years in who was the primary parent… It was not until the kids left home for university that I agreed to be on national committees that involved a lot of travel, or that I agreed to any administrative positions."

Intrapersonal Dynamics

Scientists struggle with intrapersonal dynamics in their jobs. In our course we highlight challenges in defining an identity and achieving success. Murray (2000) describes how academics define themselves as researcher, teacher or both, but that female academics were more inclined to identify themselves as teachers. One of the women we profile in our course reflected on this issue in the following way: "Somewhere in the process of my deciding between psychotherapy and research careers, a wise friend advised me by saying "… it's all about where you get your energy from." After surprisingly little thought it became clear to me that I got my energy from doing research."

Both professional and personal identity contributes to personal success. Women's career trajectories are impacted because of their commitments to other people (e.g., children, aging parents, spouses) and this can impact their perceptions of success (Murray, 2000). While there are many paths to success, these paths narrow for women (Wasserman, 2000). Lack of mentoring, isolation, difficulty gaining credibility and respect, challenges balancing committee responsibilities with teaching and research are challenges to success (Massachusetts Institute of Technology, 1999; Rosser, 2004). These variables, along with gender inequities in salaries, can negatively affect job satisfaction. When discussing gender inequities in salary, we provide students with a number of statistics reflecting that, as a rule, male academics earn more money than female academics (American Association for Women in Science Statistics, n.d.; American Psychological Association, 2000). This is made more salient to our students when they read the biography of an assistant professor who wrote "The biggest shock came, however, when a male faculty member was hired after me but at a significantly higher salary. When I questioned why someone with less experience was being paid more than me, I heard some outrageous things such as I did not need to make as much money as a man because I did not have a family to support."

Intrapersonal and interpersonal dynamics do not function independently. Interplay between these dynamics is revealed in having a voice. Having a voice entails being listened to, receiving respect, and having influence.

Pertaining to the issue of having a voice, one woman reflected on her administrative experience by writing: "I experienced the disdain some powerful men have for vocal women; and I saw and experienced the hundreds of thousands of little ways one's self esteem can be undermined by repeated experience with not being listened to, not being credited, being falsely blamed, etc." Other examples of women struggling to have their voice heard and respected can be seen in the following quotes: "I had a male colleague that began to treat me in a very unprofessional manner. I found I was being treated as a "cutsie" female, rather than as a colleague. The behavior disrupted what could have been a good colleague-to-colleague relationship." "I have had difficulty with getting my superiors to take me seriously... One of my graduate school professors told me that I would never be a successful academic because I do not "look" or "sound" like a typical academic." Some individuals, however, did not express challenges with gaining respect and finding a voice, and even considered that their careers were unaffected by their gender.

Course Effectiveness

We have evaluated course effectiveness by one indirect and two direct measures of student learning. These assessment data are limited because qualitative measures have been administered to relatively small class sizes.

The indirect measure consisted of a survey that was completed by eleven students four months after completing the course. Students were asked "What was the most memorable part of this course?" and their most frequent responses were class discussions on the biographies and the dynamics of science. Also frequently mentioned were interviews conducted with male and female academics as part of the students' group project. Thus it appeared that students found biographical material highly memorable.

When asked, "Did you find the biographies a useful method to learn about women in science? Why?" students indicated that the biographies provided a realistic view of academia and acknowledged that scientists have a regular life and face the same challenges as everyone else. One student even commented on the value of learning about the lives of contemporary women. We echo this sentiment. One advantage of using biographies of successful contemporary women scientists as opposed to women scientists with extraordinary achievements is that these women seem more accessible and real. In fact, it was clear from student responses that the issues presented in the course became real through the biographies and brought awareness that women's issues exist today. Students appreciated learning about the many ways for coping with challenges and the many paths to success. Together the results of the survey showed that biographies are an effective and memorable way to teach about science and women's issues.

A direct measure of course effectiveness is the written and oral test students take at the end of the course. In previous course offerings, the final test included a number of multiple-choice questions on the research articles and other psychological findings we covered in class to determine if students learned about the scientific areas we covered. An essay question in which students were to summarize the results of one of the research articles they read and discuss the value of the work was also required. Students' responses were graded according to their accuracy in recalling the research, understanding the limitations of it, and being able to contextualize the significance of the results within the broader research area. To assess student's learning about the dynamics of science and issues facing women in science, students were required to answer three essay style questions on the exam and to engage in a group discussion in an oral component of the exam. Though questions were modified for different offerings of the course, some examples include i) What does it mean to have a voice? In what way might women's voices be minimized in academia? ii) What are the difficulties with balancing a career and a personal life? What are three ways of achieving balance? iii) Summarize the data you were given on gender differences in academia. Describe your reaction to these data. iv) Based on the readings and the interviews of faculty members, describe four qualities of a successful career. While students could provide anecdotal evidence in their answers, it was expected that their responses reference course material. Exceptional answers synthesized multiple sources of information. Students' performance on the exam indicates that students learned about both the scientific findings we covered in this course and the dynamics of science.

Our second direct measure of course effectiveness was a pre/post-course written assignment. In our most recent course offering five students were asked to write about the process of becoming an academic on the first day of class (pre-course) and then to re-address this question in an assignment they handed in on the last day of class (post-course). On the pre-course assignment, some students revealed a superficial understanding of academia. For example, educational credentials and the importance of publications were described. Other students had a deeper understanding and noted the importance of working with others, balancing work and personal responsibilities, and gaining status and recognition. On the post-course assignment, all students acknowledged the intrapersonal and interpersonal challenges facing scientists. For instance, most students addressed inequity in the workplace and issues of achieving balance and recognition. Students who entered the course with a deeper understanding applied course material to their lives by describing personal strategies for balancing family and career and creating their own supportive network. Comparing pre- and post-course assignments indicated that all students benefited from the course and demonstrated an understanding of the intrapersonal and interpersonal dynamics of science. We were impressed by what students took away from our course as exemplified by the following two comments.

> "I hope that in my future positions I will be knowledgeable about workplace alternatives for balance and look forward to today's research being used to implement increasingly family friendly policies."

> "But most important of all, Psychology 384 [this course] has prepared me for the long journey ahead; it has helped me learn the peaks and valleys that happen on the road to a life in academics. Knowing these things, I am a better and more prepared person."

These quotes indicate that our course may be promoting students' confidence and preparation for pursuing a career in science (Campbell & Skoog, 2004).

Strengths and Limitations of Our Course

The approach used in this course incorporates the learning of psychology with learning about the social dynamics of science. This approach allows students to learn about women's issues while focusing on women's scientific contributions. Students also learn about social dynamics that will affect their career in science or any profession.

One concern about using biographical materials is that information contained in these materials could be generalized when it is not appropriate to do so or discredited as a single person's issue when it is a more general phenomenon. The use of other published sources, such as qualitative and descriptive studies, should minimize this concern.

Students have appreciated this course being team-taught. Team-teaching has allowed for drawing on a greater number of professional and personal experiences and points of view and for facilitating small group discussions. By team-teaching this course we also had a larger pool of female psychologists we could approach for biographies. Although these are advantages to team-teaching, we do not feel that team-teaching is necessary for successfully teaching a course using this approach.

What we have noticed after having taught this course multiple times is that students become knowledgeable about women's issues in general, but are more affected by conversations about salary inequity and balancing personal and professional lives. They are less reflective about the impact of interpersonal dynamics in the workplace, particularly pertaining to issues of recognition and status. In the future, we will direct more conversation and assign more readings on the importance of recognition and status for job and life satisfaction.

Applications of a Biographical Approach

Biographies can be a useful approach to teach an entire course or portions of a course. In our course, discussions of biographies and supplemental readings are equally balanced with learning about psychological research. Other courses might focus primarily on scientific research and use biographies only occasionally to illustrate women's issues or other social issues such as the effect of ethnicity, age, sexual orientation and physical disability on career development. Biographies can also be useful in highlighting and making real any issue in science such as the social responsibility of scientists, the impact of political decisions on science, and scientific integrity.

We had a very positive experience asking our female colleagues to respond to our biographical questions. Many of our colleagues replied with very lengthy responses that revealed not only their own personal experiences, but also helped to mentor our students. We have noticed that many students even consider some of the women that we have interviewed as role models. This suggests that biographies can be used to provide additional role models for students interested in science.

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Address correspondence to: Monica Mori, Concordia College, 901 8th Street South, Moorhead, MN 56562. E-mail: mori@cord.edu