Development of Role-Play Scenarios for Teaching Responsible Conduct of Research

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Abstract

We describe the development, testing, and formative assessment of nine role-play scenarios for the teaching of central topics in the responsible conduct of research to graduate students in science and engineering. In response to formative assessment surveys, students reported that the role-plays were more engaging and promoted deeper understanding than a lecture or case study covering the same topic. In the future, summative assessments will test whether students retain the lessons of the role-play experience.

Keywords: role-play, responsible conduct of research, graduate students, assessment

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1. Introduction

In response to mandates by federal funding agencies in the United States, graduate programs in many disciplines are beginning to more formally incorporate instruction in the responsible conduct of research (RCR). According to Kligyte et al. (2008), evidence for the effectiveness of RCR instruction is mixed. But previous assessments of RCR instruction (Brown & Kalichman 1998; Funk et al. 2007; Plemmons et al. 2006) did not consider whether different pedagogies might produce different long-term effects.

Pedagogy matters. According to numerous studies, surveyed by Bonwell and Eison (1991) and by Prince (2004), active learning pedagogies are superior to traditional lectures in promoting student achievement. In calculus (Treisman 1992) and physics (Hake 1998), active learning produces dramatic improvements in student performance.

Common pedagogies for teaching RCR include lectures, instructor-directed case analyses, and online training modules such as CITI (Braunschweiger & Goodman 2007). Lectures typically cover basic information such as the three principles in the Belmont Report and the accepted criteria for co-authorship of scientific papers. If as desired outcomes we merely want students to know RCR standards and to comply with the rules, then lectures might suffice. But if we want students to develop the ability to apply their knowledge in unfamiliar situations, then we should use more powerful pedagogies:

> *Discussion methods are superior to lectures in student retention of information after the end of a course; in transfer of knowledge to new situations; in development of problem solving, thinking, or attitude change; and in motivation for further learning.* (McKeachie & Svinicki 2006, p. 58)

We have developed an experiential approach to teaching RCR, through role-play. Because role-play requires the active engagement of students, we believe that students who experience a series of RCR role-plays can learn to identify ethical issues, understand multiple perspectives, and negotiate practical solutions to common ethical problems. We hope that these benefits will be lasting: long after the role-play sessions, they will recall those sessions, and they will be able to apply what they learned to ethical problems that they may encounter in their professional careers.

In this paper, we describe the development and formative assessment of role-play scenarios for teaching RCR. In the assessment surveys, students identified the advantages and disadvantages of role-play, and they listed the most important lessons that they learned from the role-play experience. Our assessment analysis is a critical first step in the evaluation of any training program and will provide a basis for our future research. Kirkpatrick (1959) describes the levels of training evaluation criteria as reactions, learning, behavior, and results. Reactions are self-reports of training effectiveness. Learning is independent measures of knowledge, skills, or attitude change. Behaviors are measures of performance in the non-training environment. Results are organizational level outcomes of the training. Our future research will examine the learning and behavior levels of analysis.

2. Role-Plays

In a role-play, students assume the roles of characters in a scenario. The scenario may be fictional or based on an actual incident. To be effective, a role-play scenario should have sufficient detail to challenge and engage the students, it should contain an underlying conflict, and it should appeal to students' imaginations (Brown 1994).

Role-plays and simulations (realistic role-plays) are frequently used for workplace training (Silberman 2007). In academic settings, role-play is used to teach ethics in engineering (Cooley et al. 1991; Didier 2000; Herkert 1997), journalism (Brislin 1995), business (Brown 1994; Raisner 1997; Sanyal 2000), clinical psychology (Johnson & Corser 1998), and health professions (Doron 2007; Garvin & Stefani 1993; Jensen & Richert 2005; Nelson & Eliastam 1991; Sofaer 1995). Although these previous papers report high student satisfaction, they do not provide careful assessments of what students actually learned. For example, Jensen and Richert (2005) described students' immediate reflections and self-assessments, rather than direct evidence of student learning. Previous papers do not explain what aspects of the role-play exercises made them effective, and what aspects might be transferable to other situations.

Few articles report the use of role-play specifically to teach research ethics. Rosnow (1990) proposed an exercise in which students examined published articles and then played the roles of the author and the Institutional Review Board (IRB) in evaluating the costs and utilities (benefits) of the research studies reported by the articles. Strohmetz and Skleder (1992) confirmed the effectiveness of Rosnow's role-play exercise in a multi-section undergraduate course on research methods in psychology. First, students read research articles and rated the costs and benefits of the studies reported by the articles; next, they engaged in the role-play exercise; finally, they rated the costs and benefits again. Students in the role-play sections changed their cost and benefit ratings significantly more than students in the control sections, who did not experience the role-play. Bragger and Freeman (1999) concluded that undergraduates found this role-play exercise very helpful in learning about costs and benefits of research. Whereas these three articles construed "research ethics" in general terms, as costs to participants and benefits to society, in this project, we focus on the responsible conduct of research (RCR). Whereas Kraus (to appear) used role-play to teach RCR to undergraduates in sociology, we study the use of role-play to teach RCR to graduate students in science and engineering.

3. Role-Play Scenarios for Teaching RCR

We have developed nine role-play scenarios that together cover central topics in RCR: authorship, conflict of interest, peer review, interpersonal conflicts in mentoring, data management and whistle-blowing, professional relationships and whistle-blowing, and compliance with regulations on human subjects, animal subjects, and hazardous materials. All scenarios are based on actual incidents, or on multiple incidents, though the details are changed to prevent the identification of the people and institutions that were involved in the incidents. A complete RCR program would include most of these scenarios to give students repeated practice in solving ethical problems. Each scenario has two speaking roles, usually a professor and a

graduate student. In some scenarios, the underlying conflict involves a third party. An example of a role-play scenario appears in Appendix 1. Accompanying each scenario are suggestions to the instructor for conducting the role-play session, and a summary/resource sheet for distribution to the students at the end of the session.

To use a role-play scenario, the instructor introduces the ethical issues, organizes the students into pairs or triads, and distributes instructions. In each small group, two students play the speaking roles; when present, the third student serves as an observer. The instructions for the two speaking roles provide divergent perspectives on the same problem. Each speaking student prepares for five to ten minutes, writing questions that his or her character would ask, and anticipating questions that the other character might ask. As the role-play runs, observers record the issues and solutions raised by the speakers, note their communication behaviors (direct, attentive, etc.), identify aspects of the interaction that might be effective in a real situation, and suggest questions that could have been asked but were not. After the role-play runs for five to ten minutes, the instructor facilitates a discussion among all students about the scenario and the underlying issues.

4. Pilot-Testing and Formative Assessment

First, we obtained approval from our local Institutional Review Board for research with human subjects (University of Illinois IRB#06726). We pilot-tested the initial drafts of the role-play scenarios with graduate students during the summer of 2007. The students evaluated the scenarios for ease of understanding, realism, and difficulty. After pilot-testing a scenario, we incorporated new issues raised by the students. In response to students' comments that the conversation was difficult to begin without some direction, we constructed dialogue starters. A dialogue starter consists of approximately 200 words of opening dialogue that could be used to start the role-play, if the speakers choose to use it.

We tested our role-play scenarios with 576 participants in 14 different sessions on our campus from the spring of 2007 through the spring of 2008. Each session lasted 50 to 75 minutes. Most sessions were conducted for graduate students in a department or a research group in a science or engineering discipline. Two sessions were conducted at the annual symposium on graduate education sponsored by the Graduate College; the symposium drew participants from many different departments across the campus. At different sessions, participants experienced different role-plays. The sessions are listed in Table 1.

Most participants were graduate students, but some were post-docs and professors. Usually we asked the professors to play student roles in the role-play to give them a different perspective, but all other assignments of roles were based on seating arrangements.

Following each role-play session, we administered a formative assessment survey. The survey, which appears in Appendix 2, asked about the participants' affective reactions and utility judgments. Participants identified the perceived advantages and disadvantages of using the role-play method versus a lecture or a case analysis. Participants stated the main lessons that they learned from the session, and they offered suggestions for improvements.

Table 1. Sessions for testing role-play scenarios

Session	Department or Research Group	Participants	Role-Play Scenario
1	Molecular & Integrative Biology	20	Authorship
2	Materials Science & Engineering	65	Miscommunication
3	Animal Sciences	85	Data Management
4	Electrical & Computer Engineering	99	Peer Review
5	Developmental Psychology	28	Professional Relationships
6	Brain and Cognition	57	Professional Relationships
7	Chemistry	46	Conflict of Interest
8	Crop Sciences	15	Professional Relationships
9	Industrial/Organizational Psychology	14	Professional Relationships
10	Veterinary Medicine	14	Animal Subjects
11	Visual Cognition & Human Performance	16	Human Subjects
12	Graduate College Symposium	41	Authorship
13	Graduate College Symposium	30	Data Management
14	Materials Science & Engineering	46	Peer Review

5. Quantitative Results

Table 2 below summarizes the quantitative responses. The majority of participants found the experience of the role-play to be either *good* or *neutral*. A majority of the participants found the role-play to be worthwhile. Most participants found our notes for role-playing and dialogue starters to be helpful.

Table 2. Summary of closed-ended responses

Session	Overall Experience	Role Play Worthwhile?	Notes Helpful?	Dialogue Starter Helpful?
1	2.25	83%	58%	NA
2	2.71	55%	83%	NA
3	2.52	61%	81%	81%
4	2.37	79%	91%	96%
5	2.00	96%	100%	93%
6	2.67	61%	100%	91%
7	1.80	100%	87%	73%
8	2.42	77%	92%	92%
9	1.93	100%	71%	86%
10	2.07	71%	92%	92%
11	2.19	50%	71%	100%
12	2.17	80%	95%	95%
13	1.90	93%	97%	77%
14	2.46	70%	87%	76%
Mean	**2.37**	**73%**	**88%**	**88%**

Notes: Overall Experience was scored on a 1 to 5 scale with anchors of *very good* (1), *good* (2), *neutral* (3), *bad* (4), and *very bad* (5). Percentages are percent of participants answering *yes* to the question. Sessions 1 and 2 were conducted prior to the construction of dialogue starters.

The Overall Experience ratings were higher when the group sizes were smaller. Specifically, sessions 2, 3, 4, 6 and 14 had some of the lowest ratings in terms of overall experience and also represented the largest sessions with 65, 85, 99, 57, and 46 participants respectively. These ratings might have been affected by other contextual factors such as the skill of the facilitator and the characteristics of the participants.

6. Qualitative Results

While the numbers in Table 2 are useful for understanding the average experience, the open-ended responses provided descriptive information about the effectiveness of the role-play scenarios. Comparing role-plays with other instructional methods, participants identified four kinds of advantages and three kinds of disadvantages:

6.1. Advantages

1. The role-play captures participants' attention and engages all participants actively
   - *Role-playing was more memorable and interactive than a lecture and evoked thought.* (Animal Sciences)
   - *I think having role play is more beneficial because it keeps people engaged. In addition, by participating in the role play, one puts oneself in the situation which helps in understanding it.* (Developmental Psych)
   - *It's so easy to dismiss the issues when you are just listening to a lecture.* (Developmental Psych)
   - *The advantage is that everyone was required to think on the issue.* (Electrical & Computer Eng)
   - *You can participate and won't fall asleep.* (Chemistry)

2. The realistic situation provides motivation and experiential learning
   - *The role play does a good job of making you realize how you would feel in that situation. It makes you think a little harder about how you would deal with this and take it more seriously.* (Developmental Psych)
   - *The complexities of a simulation are far more evident. It forces us to personalize the situation and actually make decisions as if we were faced with the issues.* (Chemistry)
   - *Hands on experience in trying to figure out what to say and do.* (Brain and Cognition)
   - *Real life interactions make it more relevant to real life situations.* (Graduate College symposium)

3. The role-play improves the depth of understanding
   - *Makes you think more critically about the ethical issues … especially in regards to conflicting issues and goals.* (Developmental Psych)

- *Much more depth of thoughts, opportunity to work at our own pace, share, interact.* (Electrical & Computer Eng)
- *Important to hear about other role playing experiences to hear the many options people came up with.* (Brain and Cognition)

4. The role-play shows different perspectives on a problem
    - *Create a discussion and makes you transport yourself to the role and situation. See it from "different shoes."* (Electrical & Computer Eng)
    - *More involved; allowed me to get a better feel for adviser's position.* (Chemistry)
    - *It makes people think, adopt different points of view, and therefore, get a broader understanding of an issue.* (Visual Cognition)

6.2. Disadvantages

1. Participants feel awkward, and some participants resist participating faithfully
    - *The actual role playing could be awkward for some people.* (Chemistry)
    - *People don't take it seriously.* (Animal Sciences)
    - *People may not want to participate.* (Developmental Psych)
    - *Uncomfortable at first.* (Brain and Cognition)

2. The role-play is an inefficient use of time
    - *It took a lot of time to convey a simple ethical concept.* (Electrical & Computer Eng)
    - *Did not cover a broad range of ethical issues.* (Developmental Psych)
    - *Discussion of several case studies would seem more helpful.* (Developmental Psych)
    - *Less efficient than case study with discussions.* (Brain and Cognition)

3. Participants lack sufficient prior knowledge and experience to play their roles
    - *A lack of knowledge about what a department head's role is.* (Brain and Cognition)
    - *Most of us don't have experience with situations like this so it's hard to think of questions to ask.* (Brain and Cognition)

6.3. Lessons

When participants identified the most important lessons that they learned from the role-play sessions, some participants mentioned the RCR principles that emerged in the discussion of the scenarios:

- *What a conflict of interest is and the option* [sic] *involved in solving it.* (Chemistry)
- *Make sure that one remains completely objective and decline to review the article if there is a conflict of interest.* (Electrical & Computer Eng)
- *You should let the editor know if you plan to have a student review the paper.* (Electrical & Computer Eng)

Most participants stated that they learned about interpersonal communication, relationships, and negotiation strategies:

- *Miscommunication can lead to bad research practices.* (Materials Sci & Eng)

- *As a student, I seldom think about my performance from my advisor's point of view.* (Materials Sci & Eng)
- *What it felt like to be in that situation – the power differential.* (Developmental Psych)
- *It gave me some practice responding to an authority figure "on the fly."* (Developmental Psych)
- *That the unknown information (which was assumed differently by individuals in different roles) was very important.* (Graduate College symposium)
- *Questions, don't accuse; clarify situation before jumping to conclusions; ethical issues are rarely clear-cut.* (Brain and Cognition)
- *Resources such as going to an emeritus faculty member—that's not something I would have thought of before.* (Brain and Cognition)

7. Discussion and Limitations

During the role-plays, some participants felt uncomfortable. This discomfort may have arisen from both their personal unfamiliarity with role-playing and the actual difficulties they would experience in a real situation. These uncomfortable feelings might have increased participants' emotional investment in the scenarios, and thereby improved their interest in the subsequent discussions. In their comments, three participants said that the discussions after the role-play seemed more valuable than the role-play itself:

- *We had our best interaction during a free conversation afterwards, discussing one on one what the problems were and how we would deal with them.* (Materials Sci & Eng)
- *The discussion that followed the role play was much more informative.* (Visual Cognition)
- *Greased the wheels for good discussion.* (Visual Cognition)

More participants reported that they learned about communication and negotiation skills than about RCR principles. In a sense, this outcome is not surprising. Prior to graduate school, students had already learned that they should not fabricate experimental data and plagiarize other authors' articles. Students might not have previously known about other RCR principles such as confidentiality in peer review, but these principles are easy for graduate students to learn. Clearly participants valued the communication and negotiation skills more highly than the RCR content. According to one participant, improvements in interpersonal skills could be the most valuable outcome of RCR sessions:

- *It seems like "ethics training" could be subsumed by good assertiveness training plus a set of ethical guidelines. The biggest problem people will have is not identifying unethical situations but dealing with others who perhaps have power or influence over them and do not act ethically.* (Electrical & Computer Eng)

The participants' reports suggest that RCR programs should not merely present the "rules of research" but should instead aim at developing students' interpersonal skills. Because many RCR problems originate from misunderstandings and worsen through poor communication, RCR programs should show students how to set expectations clearly, to raise concerns tactfully, and to disagree respectfully. Students should learn to suspend judgment and to gather information from others because their own perspectives may be incomplete. In short, RCR programs should teach

students the skills they need to become professionals. The Survival Skills and Ethics Program at the University of Pittsburgh integrates RCR instruction into skill development workshops (Fischer & Zigmond 2001).

Many participants that thought the role-play might not be worth the time because of its apparent inefficiency. A 50-minute lecture on RCR can cover a range of issues, whereas the role-play focuses on only one issue in the same amount of time. It remains to be seen if the added interest and active engagement and personal involvement of the role-play compensate for the perceived lack in coverage by increasing retention of what was covered. That is, students who participated the role-plays might retain the lessons better than students who merely listened to a lecture.

8. Future Work

We are conducting summative assessments to check whether students' self-reports are accurate, that is, whether the role-play experience has increased students' abilities to identify ethical issues, understand multiple perspectives, and negotiate practical solutions. In terms of training evaluation, these analyses correspond to the learning and behavior criteria from Kirkpatrick's (1959) model.

9. Conclusions

We have developed role-play scenarios for teaching RCR because role-play, as an active learning pedagogy, should be more effective than traditional pedagogies such as lectures in achieving significant learning outcomes. In the formative assessments of the role-play sessions, most participants said that the sessions were worthwhile because they were engaged in the scenarios, and they valued a realistic learning experience. The participants stated clearly that the role-plays captured their attention better than lectures. Furthermore, the role-plays required greater personal investment than case studies. Within the same limited time, a lecture can cover more issues than a role-play, but our formative assessments indicate that role-plays might promote deeper understanding of the ethical issues and greater appreciation of divergent perspectives.

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References

Bragger, J. D., & Freeman, M. A. (1999). Using a cost-benefit analysis to teach ethics and statistics. *Teaching of Psychology, 26* (1), 34–36.

Bonwell, C. C., & Eison, J. A. (1991). *Active learning: creating excitement in the classroom.* ASHE-ERIC Higher Education Report No. 1. Washington, D.C.: The George Washington University, School of Education and Human Development.

Braunschweiger, P., & Goodman, K. W. (2007). The CITI program: an international online resource for education in human subjects protection and the responsible conduct of research. *Academic Medicine*, 82, 861–864.

Brown, K. M. (1994). Using role plays to integrate ethics into the business curriculum: a financial management example. *Journal of Business Ethics, 13* (2), 105–110.

Brown, S., & Kalichman, M. W. (1998). Effects of training in the responsible conduct of research: a survey of graduate students in experimental sciences. *Science and Engineering Ethics*, *4* (4), 487–498.

Brislin, T. (1995). Active learning in applied ethics instruction. *Journal on Excellence in College Teaching, 6* (3), 161–167.

Cooley, W. L., Klinkhachorn, P., McConnell, R. L., & Middleton, N. T. (1991). Developing professionalism in the electrical-engineering classroom. *IEEE Transactions on Education*, 34 (2), 149–154.

Didier, C. (2000). Engineering ethics at the Catholic University of Lille (France): research and teaching in a European context. *European Journal of Engineering Education*, 25 (4), 325–335.

Doron, I. (2007). Court of ethics: Teaching ethics and aging by means of role playing. *Educational Gerontology*, 33 (9), 737–758.

Fischer, B. A., & Zigmond, M. J. (2001). Promoting responsible conduct of research through "survival skills" workshops: some mentoring is best done in a crowd. *Science and Engineering Ethics*, 7 (4) 563–587.

Funk, C. L., Barrett, K. A., & Macrina, F. L. (2007). Authorship and publication practices: evaluation of the effect of responsible conduct of research instruction to postdoctoral trainees. *Accountability in Research*, *14*, 269–305.

Garvin, W., & Stefani, L. A. J. (1993). Genethics—genetic disorder and diagnosis: a role-play exercise. *Journal of Biological Education, 27* (1), 51–57.

Hake, R. R. (1998). Interactive-engagement versus traditional methods: a six-thousand-student survey of mechanics test data for introductory physics courses. *American Journal of Physics*, 66 (1): 64–74.

Herkert, J. R. (1997). Collaborative learning in engineering ethics. *Science and Engineering Ethics*, 3 (4), 447–462.

Jensen, G. M., & Richert, A. E. (2005). Reflection on the teaching of ethics in physical therapist education: integrating cases, theory, and learning. *Journal of Physical Therapy Education, 19* (3), 78–85.

Johnson, W. B., & Corser, R. (1998). Learning ethics the hard way: facing the ethics committee. *Teaching of Psychology*, *25* (1), 26–28.

Kirkpatrick, D. L. (1959). Techniques for evaluating training programs. *Journal of the American Society of Training Directors, 13*, 3-9.

Kligyte, V., Marcy, R. T., Sevier, S. T., Godfrey, E. S., & Mumford, M. D. (2008). A qualitative approach to responsible conduct of research (RCR) training development: identification of metacognitive strategies. *Science and Engineering Ethics, 14* (1), 3–31.
Kraus, R. (to appear). You must participate: violating research ethical principles through role-play. *College Teaching*, to appear.
McKeachie, W. J., & Svinicki, M. (2006). *McKeachie's teaching tips: strategies, research, and theory for college and university teachers*, 12th ed. Boston: Houghton Mifflin.
Nelson, M. S., & Eliastam, M. (1991). Role-playing for teaching ethics in emergency medicine. *American Journal of Emergency Medicine, 9* (4), 370–374.
Plemmons, D. K., Brody, S. Z., & Kalichman, M. W. (2006). Student perceptions of the effectiveness of education in the responsible conduct of research. *Science and Engineering Ethics, 12* (3), 571–582.
Prince, M. (2004). Does active learning work? a review of the research. *Journal of Engineering Education, 93* (3), 223–231.
Raisner, J. A. (1997). Using the "ethical environment" paradigm to teach business ethics: the case of the maquiladoras. *Journal of Business Ethics, 16* (12–13), 1331–1346.
Rosnow, R. L. (1990). Teaching research ethics through role-play and discussion. *Teaching of Psychology, 17* (3), 179–181.
Sanyal, R. N. (2000). An experiential approach to teaching ethics in international business. *Teaching Business Ethics, 4* (2), 137–149.
Silberman, M., ed. (2007). *The handbook of experiential learning*. San Francisco: Wiley/Pfeiffer.
Sofaer, B. (1995). Enhancing humanistic skills: an experiential approach to learning about ethical issues in health care. *Journal of Medical Ethics, 21* (1), 31–34.
Strohmetz, D. B., & Skleder, A. A. (1992). The use of role-play in teaching research ethics: a validation study. *Teaching of Psychology, 19* (2), 106–108.
Treisman, U. (1992). Studying students studying calculus: a look at the lives of minority mathematics students in college. *College Mathematics Journal, 23* (5), 362–372.

Appendix 1
Example of a Role-Play Scenario: Data Management

Professor Role

You are a professor who just received tenure: you have conducted successful research projects, written influential papers and received awards for your work. When you started, your research group was very small, and it has grown rapidly since then. Now that you lead a large group with ten graduate students and two post-docs, you do not have the time to check everyone's work on every project. You have good students who are well trained and conscientious.

You are about to meet with a student in whom you are very disappointed. You asked the student to reproduce some preliminary results produced by your star post-doc that your lab has already published. Reproducing results is important because it confirms previous work. This helps students improve their lab skills, even if these students are unlikely to be named as authors on this series of papers. Until recently, you had a good opinion of this student's skills and work ethic.

This student seems unwilling to put in the time and effort to complete the task promptly. You assume that the unwillingness to work hard is because the student thinks the task you have assigned is boring and unnecessary. It may even stem from jealousy or from a fundamental misunderstanding of how research is conducted. Students earn the right to have others help them in the future by doing non-glamorous supporting work for you and the post-doc now. Because this student has been so lazy and slow, you had to assign a second student to work on this routine confirmation. So far, neither student has finished the task. You are frustrated and impatient.

You don't want to be too hard on the student, but the student must start working harder immediately. In your meeting, you need to balance several goals: advancing the student's education; ending an unproductive attitude; and motivating the student to complete the task soon and well.

Prepare for your meeting with your student.

Student Role

You are a second-year graduate student in a large research group. You like and respect your adviser and have been very happy in this group. Your research adviser just received tenure last year. Your adviser published an early paper in a major scientific journal and then received an award from an important federal agency. The group has grown rapidly with your adviser's success.

For months you have been trying to reproduce experimental results obtained by a post-doc in your group. Your lab has already published the post-doc's results as preliminary findings in a journal article that is getting a lot of attention. You have worked very hard to replicate the work: you have run the experiments many times, and you have watched the post-doc to see his techniques. You are sure you are doing the work correctly and still you are getting nowhere. Your adviser keeps asking you to finish and seems angry about the amount of time you are taking. You have never had anyone angry with you like this before. Your adviser recently assigned another student in the group to do the same work, and that student is also mad at you for diverting her work.

You are now sure that it is not possible to obtain the results reported by the post-doc. You do not feel comfortable confronting the post-doc yourself. The stress is keeping you from sleeping. You have an appointment with your adviser to discuss this mess. You have reviewed your notebooks to make sure that it is in good order and that you have properly documented everything you have done. You are sure you haven't missed anything.

Additionally, you don't think it would ever have been possible to do the work in your lab: your lab never had enough of the materials to complete the work that was reported in the journal article. You even checked with the department's business manager, and according to the university's electronic purchasing records, no one either inside or outside your group has ordered these materials in a few years—except for you when you started this project. Furthermore, you

have found out that the equipment necessary for at least one part of the experiment was not working in the month when the post-doc said he did the work.

You don't know what to do. You do not want to believe the post-doc made up the results but you don't know what else to think. That would be horrible for your adviser and your lab. Your adviser is not very strict in reviewing notebooks and supervising the lab, so you hope that there is some mistake that will explain the inconsistencies.

Prepare for your meeting with your adviser.

Appendix 2
Formative Assessment Survey

1. Which role did you have in the role play?

( ) student ( ) professor ( ) observer

2. How would you rate your experience in participating in the role play?

( ) very good ( ) good ( ) neutral ( ) bad ( ) very bad

3. Do you think the role-play was a worthwhile use of time for learning research ethics?

( ) Yes ( ) No

4. Specifically, what is the most important thing that you learned?

5. What do you see as the advantages and disadvantages of the role play over a lecture or written case study?

6. Did you find the role playing notes helpful?

( ) Yes ( ) No

7. Did you find the discussion starter helpful?

( ) Yes ( ) No

8. Is there anything that could be changed to improve the role play for you?

9. Other comments?