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Outcomes Assessment of Role-Play Scenarios for Teaching Responsible Conduct of Research

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Abstract

We describe the summative assessment of role-play scenarios that we previously developed to teach central topics in the responsible conduct of research (RCR) to graduate students in science and engineering. Interviews with role-play participants, with participants in a case discussion training session, and with untrained students suggested that role-playing might promote a deeper appreciation of RCR by shifting the focus away from wanting to simply "know the rules." We also present the results of a think-aloud case analysis study and describe the development of a behaviorally-anchored rating scale (BARS) to assess participants' case analysis performance.

Keywords

role-play, assessment, responsible conduct of research

INTRODUCTION

Graduate programs in science and engineering teach students the knowledge and skills necessary to perform research. In addition to the technical aspects of research, a graduate program should also teach students about the responsible conduct of research (RCR), for two reasons. First, graduate programs prepare students to become professional researchers. Just as programs in medicine and law teach future physicians and lawyers the ethics of their professions, so should graduate programs teach students the ethics of conducting research. Although students generally know that they should report data honestly and cite sources accurately, they might not know specific standards such as the criteria for co-authorship of scientific articles or specific obligations such as maintaining the confidentiality of manuscripts that they review for publication. Second, in the United States, mandates from federal funding agencies such as the National Institutes of Health (NIH, 1992) and the National Science Foundation (NSF, 2009) explicitly require that grant applications include information on the recipient institution's program of RCR instruction and that all researchers supported by the grant receive RCR training. In response to these mandates, graduate programs have begun to develop more formal methods for delivering RCR training, and researchers have begun to explore the effectiveness of these programs in promoting learning, appreciation for, and long-term retention of RCR practices (e.g., Kligyte et al., 2008; McGee et al., 2008).

In our previous work (Brummel et al., 2010), we described the development, pilot-testing, and formative assessment of nine role-play scenarios covering central topics in RCR. In each of our role-plays, participant pairs assume the roles of a student and a professor character. Each participant receives written information on the nature of the problem from one character's point of view; some information is shared, while other information is unique to each role. After preparing their roles, the participants play their roles for a brief period of time to discuss and attempt to resolve the issues, improvising when necessary. Participants' initial reactions to the role-plays were generally positive; students valued the opportunity to learn communication and negotiation skills. In this paper, we describe the summative assessment of the role-play scenarios and the development of tools for assessing the goals of this approach to RCR training.

Kalichman and Plemmons (2007) named five broad goals which can serve as a framework for formulating evidence-based research on the effectiveness of RCR training: knowledge, skills, attitudes, behavior, and community. The first goal, knowledge, pertains to the transmission of information that is critical for promoting RCR, such as guidelines and regulations on central RCR topics, frameworks for understanding ethics, and advice on where to find help. Bulger and Heitman (2008) suggested that efforts such as the Collaborative Institutional Training Initiative (CITI) program (Braunschweiger and Goodman, 2007) and other Web-based methods are efficient and effective for promoting recollection of RCR information.

The second goal, skills, pertains to developing competence in critical thinking, problem solving, communication, and conflict resolution with respect to RCR issues. Bebeau et al. (1995) and Pimple (2007) describe case discussion as a best-practice method for teaching students the skills needed to apply their RCR knowledge. RCR case discussions are a form of active learning in which students work together to evaluate a scenario involving a questionable research practice. Bebeau et al. (1995) suggested that case discussions are effective because they allow students to practice using critical reasoning skills to develop a reasoned response to a problem, and Pimple (2007) proposed that case discussions are effective because they are narrative; that is, a case tells a story. Stories—often taking the form of fables, parables, or allegories—are a traditional method in many cultures for conveying wisdom to others. When applied to RCR training, this time-tested method provides a close approximation to actual research experiences, giving students an opportunity to re-organize their knowledge towards its actual application.

An RCR role-play can be conceptualized as an extended case discussion in which students play the roles of central characters who are involved in the case. Adopting the terminology that Hertel and Millis (2002) used to describe what they labeled simulations, students in a role-play are instructed to "be" a character, whereas in a case discussion, students only imagine what it might be like to be that character. Therefore, we believe that role-playing gives an even closer approximation to actual experience than a case discussion. In addition, "being" a character introduces a social component that cannot be achieved with a case discussion (Hertel and Millis, 2002); students must not only apply their knowledge, but must also negotiate with another character who has different information, perspectives, and motivations. We believe that this social component is important for students to experience, not only for developing communication and negotiation skills but also for cultivating a greater appreciation of the crucial role that social factors play in resolving an RCR issue.

The third goal of Kalichman and Plemmons (2007), attitudes, is of particular interest with regard to role-playing because we have reason to believe that participants' attitudes toward participating in a role-play might change over time. Our data suggest that the initial reactions of role-play participants

are less positive than the initial reactions of case discussion participants[1]. In our formative assessment, several students stated that role-playing was uncomfortable. We believe that some of this discomfort is due to the experience of a "disjuncture" (Jarvis, 1987, pp. 79–84) between the experience of the role-play and the student's previous conceptualizations of the topic. However, these disjunctures can prime students to engage in future efforts to develop knowledge and skills which will bring "equilibrium" back to their conceptualization of the topic (Jarvis, 1987, p. 80). This equilibrium process likely only begins to unfold during the role-play and, therefore, student's initial reactions are likely still a reflection of their general discomfort.

Before we describe our specific research questions, we first describe how a typical role-play session and a typical case discussion session are conducted by our research team. Next, we compare and contrast these two types of training and describe our research questions.

DESCRIPTION OF ROLE-PLAY AND CASE DISCUSSION RCR TRAINING SESSIONS

Four of the authors facilitated the RCR role-play sessions from which we recruited interview participants; two of these same authors facilitated the case discussion sessions. Although each author has a unique style for delivering the material, we follow a similar overall format for facilitating RCR sessions. Both types of sessions typically last sixty to ninety minutes.

Role-Play Session

We typically begin a role-play session by describing the technique and telling the participants that we believe the experience will be valuable if they remain engaged throughout the session. We then provide a brief (five-minute) introduction to the RCR content area that will be covered in the role-play to ensure that everyone has at least a minimal understanding of the topic. For example, for the peer review role-play, we explain what peer review is and when it is used, and we describe some of the duties of a reviewer. The peer review roles are presented in Appendix A.

After we describe how the role-play will be conducted, we organize the participants into pairs. We encourage them to play their roles as authentically as possible. We attempt to alleviate any anxieties about the technique by assuring them that there are no right or wrong ways to play their roles. A student who is still hesitant to participate in the role-play is allowed to serve as a third-party observer of one of the pairs. Each pair receives a printed copy of the instructions for their roles; one person in each pair receives the professor role, and the other receives the student role. They are given time to prepare their roles; if time permits, we sometimes have participants with the same role meet in small groups to share ideas before engaging in the role-play.

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[1] We asked ninety-seven students who attended a role-play session and thirty students who attended case discussion session, all from the same department, to rate their overall experience in the session on a scale from 1 (very bad) to 5 (very good) scale. Both sessions were presented by the same individual (one of the authors). Overall, reactions to both sessions were neutral (rating of 3) or positive (rating of 4 or 5). The mean rating from the role-play participants was 3.5 (SD = 0.69) and the mean from the case-analysis discussion participants was 4.1 (SD = 0.61). A two-tailed t-test for the difference between the means was significant ($t = -4.07$, $p < .05$; Cohen's $d = .92$). Cohen's d is an effect size measure that is calculated by taking the mean difference divided by the pooled standard deviation; it can be interpreted as the number of standard deviations separating the score of an average member of one group from an average member of the other group. In this case, the average member of the case discussion group rated the session 0.92 standard deviations higher than the average member of the role-play group.

The role-play itself typically lasts less then ten minutes; this is enough time for most pairs to expose the main issues and to begin to discuss how to approach them. After the role-play, we initiate a discussion of the ethical issues that apply to the specific RCR content area that was covered in the role-play. We also ask the participants to reflect on how they approached their roles, and we discuss the importance of communication, understanding others' perspectives, and gathering information before acting. At the end of the session, we give students a handout that reviews the topic of the role-play and lists resources for further reading; the resource list includes reading material that is specific to the role-play content as well as resources that provide general guidance (e.g., Gunsalus, 1998; Macrina, 2005; Online Ethics Center; Shamoo and Resnik, 2003).

Case Discussion Session

We typically begin a case discussion session by emphasizing the importance of research ethics, either by explaining how the research community benefits from accountability in research, or by providing examples of situations in which research has "gone wrong." Next, we quickly list typical issues in RCR. We stress that RCR involves more than just avoiding dishonest behaviors such as fabrication or falsification and includes issues such as handling errors, deciding on authorship, confidentiality in peer review, treatment of human and animal subjects, and the student–mentor relationship. After introducing these issues, we describe a simple approach that the students can use to address ethical problems: identify the parties and their responsibilities, consider alternative actions and consequences, and evaluate these actions and consequences according to basic ethical values such as honesty or fairness, or according to or specific tests such as harms versus benefits.

For the bulk of the case discussion session, participants discuss three or more short scenarios that raise common RCR issues that participants are likely to encounter in their disciplines. For each scenario, we read the scenario aloud, and then ask the participants to discuss the scenario in small groups of two or three for five minutes. Then for the next five to ten minutes, we lead a general discussion with the entire audience to derive the lessons of the scenario, asking participants to volunteer their recommendations and reasoning. The session ends with a summary of the lessons learned.

RESEARCH QUESTIONS

In our formative assessment article (Brummel et al., 2010), we found that students valued role-playing because it captured their attention, provided them with motivation through experiential learning, increased their depth of understanding of the issues, and allowed them to consider multiple perspectives. We expected that role-play students would report similar positive reactions months after the role-play session. However, as noted above, their initial attitudes might be less positive than those elicited from other training methods because of the discomfort in role-playing. We are interested in whether attitudes towards role-playing are more positive after this feeling of discomfort has dissipated; that is, after significant period of time has passed. As mentioned in the previous section, this initial discomfort might actually be beneficial, due to the disjunctures it creates.

We are also interested in how attitudes towards the training and conceptions of RCR might differ between students who participate in a role-play and students who participate in a case discussion. To address these questions, we implemented a semi-structured interview protocol to examine differences between students' reactions to the training, self-reported learning outcomes, and self-reported conceptions of RCR.

Both role-play and case discussion sessions focus on the analysis of one or more scenarios involving questionable research practices. However, because role-playing requires participants to actively and personally engage in the scenario, we believe that it can result in deeper learning about RCR than a case discussion format. From our own experiences in delivering role-play training sessions, we know that many students thought they "knew the answer" to how they should approach their roles, but then were surprised when they learned that the person playing the other role had different information or opinions, requiring them to modify their approach. Because a role-play session highlights the importance of gathering information and understanding viewpoints prior to taking action, we expected that role-play participants would be more likely to report that these preliminary actions are important in deciding how to address an RCR problem.

We did find that some students were concerned that a role-play session covers only one RCR content area and that more information could be covered with a format that requires less active involvement. Because each role-play session covered only one RCR topic whereas each case discussion session covered three topics, we were also interested in whether these two groups of participants would differ in their self-reported learning outcomes or reactions with regard to content coverage. Although we expected that role-play participants would express more concern about breadth of coverage, we also expected that role-play participants would demonstrate a deeper understanding of, at minimum, the ethical issues addressed in the RCR content area covered in their training session, and would also convey a deeper appreciation for the opportunity to learn different perspectives on any RCR issue (see Brummel et al., 2010).

METHOD

Sample and Demographics

We designed a study using interviews to gather data, and we obtained approval from the local Institutional Review Board (University of Illinois IRB #06726). We conducted individual interviews with seventeen students who had attended a role-play session and thirteen students who had attended a case discussion session. A minimum of two months had elapsed since the students had participated in an RCR training session; the average time elapsed was over six months. We also interviewed a control group of eleven first-year graduate students during their first month of graduate study who had not yet received any departmental ethics training.

The demographics of the role-play, case discussion, and untrained student groups are summarized in Table 1. This table includes information on the academic departments represented by each group. As can be seen in the table, each group was represented by a relatively equal number of engineering students and science students.

Table 1: Demographics and Departments Represented in Current Study

Training session type	Sex	Age mean (*SD*)	Mean/ median year in graduate school	Departments represented	Domestic/ international
Role-Play (*N* = 17)	10 men, 7 women	28.6 (5.1)	3.6/4	Electrical and Computer Engineering (4), Psychology (7), Library and Information Science, Labor and Industrial Relations, Anthropology, Bioengineering, Veterinary Biosciences	14/2

Training session type	Sex	Age mean (*SD*)	Mean/ median year in graduate school	Departments represented	Domestic/ international
Case Discussion (*N* = 13)	7 men, 6 women	24.9 (3.1)	1.5/1	Electrical and Computer Engineering (5), Nutritional Sciences (5), Environmental Engineering (2), Kinesiology and Community Health	10/3
Untrained (*N* = 11)	6 men, 5 women	22.2 (.75)	1/1	Civil and Environmental Engineering (5), Psychology (4), Materials Science and Engineering, Natural Resources and Environmental Sciences	10/1

One role-play participant had attended a case discussion session in a previous semester and was, therefore, excluded from all data analyses, with the exception of the qualitative interview analysis. Age information is unavailable for 3 role-play participants and 2 case discussion participants.

We note that, as shown in Table 1, the mean age of the role-play sample, 28.6, is higher than the mean of the case discussion sample ($M = 24.9$; $t = 2.1$, two-sided p < .05; Cohen's $d = 0.88$). We will discuss this potential limitation with regard to our conclusions in a later section.

Interview Protocol

In the first half of each interview, we first asked students to describe their background in research and to recall any previous ethics training. We then asked the role-play and case discussion students to describe their recollections and reactions to their participation in an RCR training session. Specifically, we asked these students whether they liked the training experience, whether they found it useful, and whether the experience changed their views about research ethics. In place of these training reactions questions, we asked the untrained students to describe their conceptions of the term "research ethics" and to give reasons for why research standards exist.

We followed a semi-structured interview protocol: all students were asked the same questions, and follow-up questions were used to encourage participants to elaborate on or clarify their responses, when needed. When asking follow-up questions, interviewers were careful to avoid leading the students' responses. For example, in the sample transcript below, the interviewer encouraged the student to elaborate on her response to the question, "Did you like the overall role-play experience?":

> Student: Yeah. I think, coming from a performance arts background, I enjoyed it.
>
> Interviewer: Would you say that your artistic background is why you enjoyed it so much, or were there other reasons?
>
> Student: Well, it was useful to think about what would I do in this situation. I had no problem immersing myself in that situation and imagining the situation.

In this example, the interviewer first gave his interpretation of her answer and then asked whether his interpretation was accurate. The student's response helped to clarify why she believed her performance arts background influenced her enjoyment of the role-play.

The interview protocols are in Appendix B.

Interview Coding Procedure

Our coding procedure for categorizing students' responses to the training reactions questions involved several steps. First, for each question, three of the authors read the participants' responses to identify recurring themes that indicated possible differences between case discussion and role-play students' responses. These three authors then met to reach consensus on how to best characterize these differences. During this process, we discovered that the themes did not always correspond to a particular interview question. This made the process of coding more difficult and necessitated a more structured approach. Accordingly, two of the authors conducted a formal count for each student to determine whether the theme was present in each student's responses to any interview question. The formal count did not necessitate any major changes to the consensus decisions that we had previously reached but did help to uncover additional themes that we had not yet identified. Finally, after drafting a report of the results, several of the authors then re-read the students' transcripts to confirm that we had accurately characterized the interview results and to re-confirm the formal counts. We followed a similar procedure for coding the untrained students' responses.

Case Analysis Protocol

In the second half of each interview, students analyzed two short RCR cases: one case presented a problem similar to one presented during the RCR training session that the student attended (matched case analysis), and the other presented a problem in which the core issue was not covered in the student's training session (unmatched case analysis).

A well-designed case study requires several rounds of development, to ensure that the case is realistic and relevant, comprehensible, and engaging. The Online Ethics Center for Engineering and Research (OEC) (www.onlineethics.org/Resources/Cases.aspx) provides numerous tested RCR case studies and expert commentaries on these cases. At the OEC, we located a case study relevant to each of our nine content areas. We edited each case so that it focused primarily on the content area of interest, presented the case from the vantage point of the student, and was otherwise similar to the others in style, length, and format. To illustrate, the student role for our peer review case is given in Appendix A, and the corresponding OEC case is given in the Appendix C; we also provide a Web link to access our materials for the other eight content areas, as well as Web links to the corresponding OEC cases.

For each case analysis, students were instructed to "think aloud" to: (1) identify the issues; (2) describe the various viewpoints; and (3) propose a solution that would help resolve the issues and describe any problems that might occur in resolving the issues. We used modified versions of Bebeau et al.'s (1995) first two criteria for evaluating the quality of students' responses to moral problems (identify issues and points of ethical conflict; consider each interested party's expectations). We based our third criterion, negotiating practical solutions, on the work of Whitbeck (1995, 1996), who emphasized that a person faced with an ethical problem should act as a "moral agent" who creates and evaluates possible solutions.

Case Analysis Scoring Procedures

Recently, research on the assessment of RCR training outcomes has received increased attention. Although many researchers present well-formulated rubrics for naming important criteria that should be evaluated (see http://openedpractices.org/files/Scoringelements for ethical decision

making.pdf for examples), there is relatively little research on how these criteria should be measured (Steneck and Bulger, 2007).

Sindelar et al. (2003) found that trained raters were able to reliably score participants' ethics case analysis performance by applying an explicit scoring rubric to each criterion. We developed such an explicit scoring rubric through the use of a behaviorally anchored rating scale (BARS) approach. A BARS rubric graphically links numerical scores (e.g., 1 = low to 5 = high) to written examples of typical behaviors or statements (anchors) that define each score. The BARS approach is frequently utilized in the employee performance appraisal literature (Borman, 1986).

We implemented an iterative approach to develop a BARS rubric for each of the three case-analysis scoring criteria. Three of the authors were involved in this process. First, we agreed on initial, generic anchors that would characterize a low, medium, and high score for each criterion. For example, we agreed that participants would receive a low score on Understanding Multiple Perspectives if they simply restated the positions of the two main parties as they were described in the case. We agreed that a medium score would be associated with an attempt to explain these two viewpoints, and that a high score would be given for a balanced analysis of several viewpoints, including the viewpoints of characters not named directly in the case.

Second, we linked the anchors to illustrative statements made by students in the case analysis portion of the interview. Two of the authors extracted statements from the case analysis transcripts that they judged as being representative of each score level. We also modified some of the statements made by experts in the OEC case commentaries. The same three authors then met again to develop a first draft of the BARS rubric. During this meeting, we adjusted the anchor descriptions so that they better represented the types of statements that were actually observed in the case analysis transcripts. Also, because our initial criteria for a very high score (5) were almost never met by students in our sample, we adjusted our criteria slightly downward to reflect a superior response relative to the majority of students, as opposed to an "ideal" or "perfect" response. A score of 5 on the BARS thus represents a compromise between a superior response in an absolute sense and a superior response relative to our student sample. For example, as shown below, the sample transcript of a very high score (5) for the criterion Negotiate Practical Solutions/Understanding Consequences, we acknowledge that the student's proposed solution is not necessarily one which would be proposed by an RCR expert, but it reflects one of the best student responses.

For the final phase of the BARS development, we each individually scored a second subsample of case analyses and then met to discuss the scores. When our scores differed by more than one point, we reviewed the transcript together and attempted to resolve the discrepancy by means of a discussion. In a few cases, we were unable to reach consensus; however, we were able to resolve all remaining discrepancies by making minor changes to the wording of the BARS anchors. The final version of the BARS is shown in Fig. 1.

Figure 1: BARS for Scoring Case Analysis Performance and Representative Quotations from the Peer Review Scenario.

Identify moral issues

1_____

Indicates that there is no problem, or states that there is a simple disagreement amongst the parties.

> *If I'm the expert of this area, I can judge whether the paper is good or not. And if I'm the expert of this area, it's very likely that I do very similar research. I can use the knowledge of the unpublished paper.*

3_____

Misses some of the moral issues present in the case. Primarily restates the issues as presented in the case without naming the issue or mentioning specific standards.

> *Ok, well the issues are obviously that, Slater and Parker plagiarized the report, not directly plagiarizing the report, I don't know, coming from a social science background, I'm not sure what plagiarism entails in this sort of situation, but they are basically taking someone else's ideas and squelching those ideas by using something they think is useful to them.*

5_____

Accurately identifies and names most or all of the moral issues present in the case. If applicable, mentions relevant standards.

> *The person reviewing the article has accessed information that isn't publicly available, . . . and when they get to doing their own experiment, they want to use this technique, and the technique is still unpublished. There's also the issue of sharing a manuscript to be reviewed, and working on a review collaboratively . . . It's privileged material they otherwise wouldn't have access to, so they can't just take it and run. There's also the issue of . . . these guys are reviewing the manuscript of a direct competitor, and they're not exactly unbiased in their review*

Understand Multiple Perspectives

1_____

Primarily restates the behaviors of the parties involved as they are given in the case; states that there is no excuse for the behavior of one or more of the parties.

> *The rival lab, who obviously would like to take all of the credit for this and could possibly, selfishly, not want this lab to use these techniques at all – they might have preferred to keep this completely secret just to slow their competitors down.*

3_____

Explains at least two viewpoints. However, the focus is either primarily on the interest of only one of the parties involved, or the student indicates that the parties involved are entitled to their opinions but that one perspective is "more correct" than other perspectives without providing justification.

> *[On] one hand, you want to have productive research to add to a body of knowledge, everybody's sort of working together in this . . . [but] it's obvious they couldn't be objective, they want them to be wrong. Consciously or subconsciously. So I think the professor right away should have said "send it back, sorry, . . . I'm not unbiased" but everyone wants to think they're not biased, so I think that's where they justify that.*

5_____

Presents a balanced view from the perspective of several involved parties. States the different attitudes, values, and possible motives of the parties without making unfounded assumptions about intent.

> *The student wants to trust her advisor but is concerned it isn't right not to attribute credit where credit's due. The journal, basically trusted him to be objective and act in an ethical manner. The rival lab is concerned about getting biased reviews; they're concerned about getting credit for their work.*

Negotiate Practical Solutions/Understanding Consequences

1_____

Solution is to ignore the problem, to interfere or "go behind someone's back", or act immediately without considering whether this is the best course of action. Student does not mention, or devalues, the undesirable consequences of the chosen solution.

> *I will find some way that we can both publish the paper. It is just a technique. A technique is mastered to do research, and the topics [of the research] are different; we can use the same technique. I want to find some way that we can both publish the paper. [After they publish the paper] the competitor will know that they published a paper, and that they used a technique of their own. And they are not sure whether the technique is still from them or they think about it of themselves. So the competitor must know whether they steal the technique or not. It may be hard, so they have to prove that the two, the professor and the student, did something wrong.*

3_____

Solution is practical, but incomplete or vaguely formulated. Student understands some of the consequences of the proposed solution but does not propose strategies for minimizing these consequences.

> *One option would be that before they publish the result, that they contact the competitor's group, and discuss the situation to see if they want to make it a joint article between the two groups—one contributed the purification process, the other contributed the experiments. [But] reviews are supposed to be anonymous. You're not supposed to, in most cases, know the reviewer. I guess they could work through the journal, there's some editor at the journal . . . they could ask the editor of the journal to tell the guys to just publish just their purification stuff so that somebody could attribute credit to it, and there's a mediator there.*

5_____

Solution is practical and directly addresses the issues at hand. Solution aims to optimize the outcomes of all parties involved and to maintain relationships and reputations. Solution adopts standard best practices and does not violate ethical standards. Student understands the consequences of the solution and mentions strategies for minimizing negative consequences.

> *Everyone wants to think they're not biased, so I think that's where they justify [doing the review]. So I think the professor right away should have said "send it back, sorry, I can't, we're working on something too similar; I'm not unbiased." Then, assuming both parties are open to it, it might be worth looking into collaboration, contacting them and saying "Look, kind of a weird way for this to come out, but we could really use this to make our work much more complete, where everybody's name's on it," that might be a good solution for everyone. I think you have to spin it in a very positive way, not that what they have isn't good, but that it could be a strong go-to reference for this area of research. I know sometimes universities have intellectual property protection; they might not want to give it to them, so even if they approach them, they might get rejected.*

INTERVIEW RESULTS

The following section describes the results of the interviews with the untrained students. According to Heitman et al. (2007), in order to best understand the impact of RCR instruction on learning, it is important to first describe student's baseline conceptualizations of research and research ethics. Therefore, the results of the interviews with untrained students help to contextualize and interpret the results outlined in the "Assessment of Case Analysis Performance" section below, where we compare and contrast the interviews of the role-play and case discussion participants.

Interviews with Untrained Students

In order to determine how RCR training might affect students' conceptualizations of research ethics and research standards, we should first understand how students think about these issues before they have received any formal RCR training. We asked the untrained students to talk about what came to mind when they thought about the term "research ethics" and to give reasons for why research standards exist.

Overall, as expected, the untrained students had some difficulty in responding to questions about research ethics and research standards. Students were generally hesitant in formulating their responses, and most of their answers were relatively brief. We found some common themes across the eleven interviews, which we will now describe.

When asked what came to mind when they thought about the term "research ethics," the most common response was to talk about specific RCR topics, in particular data integrity (data management, fabrication, and falsification) and plagiarism.

In addition to the issues of data integrity and plagiarism, some students also talked about issues pertaining to human and animal subjects research. Interestingly, two of the students that mentioned human and animal subjects research were engineering students. Both of these students remarked that they thought there were more ethical issues in human and animal subjects research.

- I'm thinking engineering research is way different from much actual research because you can't really do a lot about actual things like when you're testing a concrete wall to see if it falls down … If you're testing a beam, you're testing a beam. It's not an ethics problem.
- A lot of [my undergraduate research] had to do with getting results that are usable, that aren't skewed, so for me I had to maintain the equipment and make sure that it was clean or else tests that were taken on the equipment could skew the results … But for me it's kind of, if I was doing something like animal sciences, testing on animals, that [type of research] could be a little unethical, that sort of scope right there. But for me it's kind of limited to using skewed results or that sort of thing.

The content areas mentioned by the untrained students are those that are commonly presented in undergraduate courses in science and engineering. Topics such as conflict of interest, authorship, peer review, and professional relationships are less frequently encountered in undergraduate curricula, and they were not mentioned by the untrained students. In order to develop a thorough understanding of the breadth and complexity of RCR, students must first become familiar with all of the central RCR content areas. It is clear in our sample that these students do not yet have an understanding of the complexity of RCR.

When asked to give reasons for why research standards exist, students' responses indicate that they tend to think about research standards in terms of explicit rules that dictate what researchers must and must not do. Their responses suggest that they view decisions regarding research practices as relatively straightforward to evaluate.

- The reasons are to basically curb some experimenters that are blinded by the quest for knowledge, I think … [Standards are] kind of there to make sure that people have perspective or at least to force perspective on them.
- … You need to follow [the standards] because obviously they've been thought up to, what am I trying to say? To keep you, to keep your results accurate. [Standards] kind of help guide you through what you're doing and making sure you're safe for yourself, you're safe for the

people around you, and then through your results that you've used, you've used standards to help you to get accurate data that you can actually use.

Additionally, several students recalled historical examples that are frequently used in introductory courses to illustrate these issues.

- Well I would guess that it's probably one of those "learn from the past" kind of things, like in pretty much every psych class I took, we learned about the Tuskegee study and the Nazi trials and all of the Milgram, all the old standards of ethical studies. So I guess it's kind of once you see how dangerous research can be, you realize you have to take steps to sort of prevent it from happening again.

What is missing from the untrained students' responses to questions about research standards is an appreciation for the complexities inherent in actually applying a research standard. Although we did not ask follow-up questions that might have more directly elicited this type of a response from the students, the results indicate that students likely do not think about the contextual factors that make standards difficult to apply until they experience the difficulties for themselves. This tendency was echoed by some of the participants in a 2008 ethics education workshop sponsored by the National Academy of Engineering (NAE), who reported that former students often remarked that they did not appreciate ethics instruction until faced with a complex ethical question on the job (Hollander and Arenberg, 2009).

Interviews with Case Discussion and Role-Play Participants

1. When asked whether they liked the training experience, many students in both groups indicated that they had enjoyed the training session. Many case discussion students remarked that they thought the format was more desirable than a standard lecture format:
- I don't want to sit through another PowerPoint lecture. [You] can't even stay awake let alone take in what you're learning. I mean, it was interactive and there wasn't even a computer in sight … [the format] made it a lot easier to discuss with the people around me. I can't think of a better way to present it. (case discussion student)
- I think that since we had to be there for that hour anyways, we probably got more done. (case discussion student)
- Doing an activity forced me to think about [the issues]. (case discussion student)

In contrast, role-play students who enjoyed the experience focused very little on evaluating the format of the session. Instead, many of the role-play students merely implied enjoyment by explaining that they valued the experience (these statements are summarized in Item #3 below). However, some role-play students—both those who enjoyed the experience and some who did not—felt some discomfort in the role-play format:

- I think [role-plays] are awkward and … make me feel like a little kid.
- It felt a little awkward to be with your peers pretending to be someone else.

Finally, two of the role-play students who did not enjoy the experience stated that they found more value in discussing the issues than in doing a role-play.

- After a brief actual engagement in the role-play [my partner] just kind of got off topic and was like, "No, let me tell you this story." So we kind of bailed on the role-play he basically just described a situation of what actually happened. So it became more a personal case study than a role-play session.

- I'm not sure the role-play itself [was useful], but afterwards I think that maybe … you can always go to other faculty and then the department head, but even if you get stuck there, there are other places in the university you can go, which I wasn't aware of.

2. Some case discussion students questioned the personal relevance of the cases they analyzed. Specifically, although they acknowledged that the information could eventually be relevant, five case discussion students commented on the timing of the training, questioning whether the content of the cases was valuable for their current roles as graduate students.

- I'm sure that whenever I start publishing, it will definitely matter a little bit more … but overall it just sort of made me think about how I would rather be researching in the lab and writing papers than listening to a presentation that didn't seem particularly relevant.

Three role-play participants also expressed some concern about relevance; however, instead of questioning the timing of the RCR topics covered in the training session, these participants felt that it was difficult to assume their role:

- "I had trouble really identifying with the role play I was suppose to do, because I really couldn't even imagine myself in that situation. … Although it made me think more about what I'd do if something like that happened to me, because of the environment I'm in now, I can't even imagine that happening. Because my advisor and I … have a good relationship, I hadn't really thought of [this issue] before [the role-play]. Hard to imagine myself in that situation, but it made me start thinking about it."
- I wasn't incredibly thrilled with [the role-play], and in some ways I feel like … trying to figure out how to put myself in an unfamiliar context … in some ways took away from my ability to understand the situation.

Students' comments about relevance suggest that it is important for a training session facilitator to emphasize to students that the format of the session is not necessarily geared toward learning the content of the cases or towards a current issue that the student is facing; rather, facilitators of both types of sessions should stress that the training provides students with an opportunity to learn new knowledge and skills that they can apply in many types of situations.

3. Many students in both groups made statements indicating that engaging in a case analysis was a valuable learning experience. Several students made statements indicating that they valued the opportunity to prepare for future problems. Compared with the role-play students, we found that case discussion students (5 students—about half of the sample) talked more about how they valued the opportunity to learn the specific rules that pertained to a case. These students talked in a very absolute sense about rules; some remarked that the behaviors exhibited in a case were either "right" or "wrong," while others explained that "knowing the rules" was sufficient to address or prevent future problems:

- I had only learned [general information], but I had a very specific question about quoting people … he gave me a good answer for how to determine when you quote or cite somebody.
- I liked reading through the stuff and seeing if it was ethical; [it] taught me some stuff because there were things where I didn't know if they were ethical or unethical.
- I knew I had to follow the rules so it drew out the fine lines of what the rules really are; … if you follow the rules you don't have to worry about getting in trouble or having something come back to get you.

The content of the case discussion students' statements regarding the value of the training session is strikingly different from the statements made by role-play students. Twelve role-play students (about 70% of the sample) talked about valuing the training experience, but they talked very little about learning explicit rules during the role-play; in fact, only one role-play student made a comment to this effect. Instead, these students appreciated the opportunity to rehearse how they could address a real-life problem:

- … [in my past ethics training experiences], we've had just kind of general ethics sessions, and it was kind of just a presentation about some issues and what you should do. I felt having a concrete example—with people taking on the role of these characters and expressing their own beliefs—made this more real: what the situation might be like.
- I thought it was useful, to go through the motions of what you would or wouldn't do. You have to reflect on it a little more in case it happens in the future.

Several role-play students' comments also demonstrate an appreciation for the complexity involved in interpreting a rule, in particular by acknowledging the interpersonal factors involved in addressing an ethical problem (6 students). For example, these students said they felt more prepared to negotiate these interpersonal aspects if they encountered an issue, explained that they would try to avoid making assumptions about others' intentions, or acknowledged that playing their roles made them more aware that they need to consider others' opinions and perspectives when trying to find a solution to an issue. Some role-play students also emphasized the need to gather additional information before acting, and indicated that they learned valuable information on how they could obtain the necessary information (e.g., talking to a faculty member not involved with the issue, getting advice from an authority outside of the department).

- … if [you] do not feel the conflict you cannot think about it very deeply … I know what I should do in most situations, but you have to balance your principles with the specifics of the situation.
- … there's usually more than one point of view, so even when things seem very clear-cut, [you shouldn't] make assumptions about what is happening… .
- It was good to kind of put yourself in that person's shoes and pretend that someone was coming to me and complaining so it was interesting to think about the other side.

Three case discussion students did talk about how the session helped them to appreciate others' perspectives on an issue; this indicates that at least some of the case discussion students appreciated the complexities involved in interpreting a rule; however, their focus was on the perspectives of their peers during the training session.

- … working in a group setting and being able to discuss the topics with your peers was beneficial, and it was interesting to see that it's fairly gray, there was not necessarily absolute right answer to the way things could be interpreted.

The responses of case discussion and role-play students as summarized above suggest that role-playing might be more effective for helping students understand that RCR rules are not always straightforward to apply. In general, role-play students responses demonstrate a deeper understanding of the complexities involved in resolving an ethical problem. They appreciated both the complexities involved in applying a rule and in the interpersonal factors that are involved in resolving an ethical problem.

Discussion

The interviews with the untrained students help us to better appreciate the statements made by role-play and case discussion participants regarding their reactions to the training sessions. In particular, the results presented in the previous section indicate that not only do role-play and case discussion participants value the opportunity to learn about RCR content areas that they might not have thought about before, but many of them also valued the "disjunctures" that prime them for learning while participating in a case analysis (Jarvis, 1987). That is, a case analysis requires students to conceptualize their previous experiences and understanding of RCR content in a new way.

For the case discussion students, these disjunctures seem to involve learning that rules can sometimes be interpreted in different ways. Using Perry's (1999) terminology, these students no longer view RCR knowledge as dualistic (knowledge is black and white and there is always a correct answer), but are reaching the multiplicity stage (some answers will always be a matter of opinion) in their understanding of RCR. For the role-play students, these disjunctures involved a realization that interpersonal factors play a significant role in how one actually resolves an RCR issue. Using Perry's terminology, these students demonstrate relativism, or an understanding that answers require one to gather real evidence and to then commit to a course of action. Instead of just valuing the opinions of other students in the training session, these students appreciated the opportunity to think about how they would actually approach an RCR issue. This result suggests that, compared with a case discussion, role-playing might better serve the purpose of fostering a deeper appreciation of RCR.

ASSESSMENT OF CASE ANALYSIS PERFORMANCE

Given that a role-play session covers one RCR scenario, whereas a case discussion session covers three RCR scenarios, we are interested in how this difference might affect students' ability to analyze both a matched and an unmatched scenario. Specifically, we are interested in whether the format of a training session might influence the ability to (1) identify the scenario's ethical issues; (2) understand multiple perspectives on these issues; and (3) negotiate practical solutions.

Three of the authors served as coders of students' case analysis performance using the BARS scoring rubric; each student was assigned to two of the three coders. While scoring the case analyses, we had no information on which group the student belonged to (role-play, case discussion, untrained). For each participant, the two coders first scored the case analyses independently; when these initial scores differed by more than one point, we met to resolve the discrepancy. In some cases, during discussion both coders agreed that the midpoint between the discrepant scores was a better representation of the participant's score, and therefore, both coders changed their scores. In some cases, only one coder changed the score, either to the same value or within one point of the other coder's score; usually, this occurred when one coder had overlooked or misinterpreted a portion of the transcript which the other coder had deemed important. Final scores for each participant were calculated as the average of the two coders' scores (or resolved scores).

As can be seen in Table 2, we were able to reliably score participants' case analyses using the BARS scoring rubric. Approximately 89 percent of the two coders' initial ratings agreed perfectly or differed by only one scale point. In other words, reconciliation meetings were only required for 11% of the ratings.

Table 2: Raw Index of Rater Agreement for Initial Ratings

Score Difference between the two raters	Percentage of ratings
Perfect agreement	36

1 point disagreement	53
Greater than 1 point disagreement	11[*]

Percentages across total of 207 ratings: each of 11 untrained subjects analyzed one case, and each of 29 other subjects analyzed two cases; for each case analysis there were three ratings, one each for issues, perspectives, and solutions. All case analyses which were scored were included in this analysis, regardless of whether the case was included in the analyses discussed later in the article.

*All but one of these was a 2-point difference.

Case Analysis Results

As can be seen in Tables 3 and 4, we found that role-play students can identify moral issues, understand multiple perspectives, and negotiate practical solutions as well as the case-discussion participants. Students in both trained groups appear equally capable of analyzing a scenario on an unfamiliar topic as they are of analyzing a new scenario based on a familiar topic. As expected, untrained students received somewhat lower scores (Table 5).

Table 3: Matched Case † Averages

	Issues	Perspectives	Solutions	Average
Role-Play (N = 16)				
Mean	3.41	3.19	3.16	3.25
SD	.84	.81	1.00	.88
Case Discussion (N = 10)				
Mean	3.40	3.35	3.15	3.30
SD	.46	.58	.71	.58
Effect Size				
D	.01	−.23	.01	−.07

Two-tailed t-tests indicate that none of the group means are significantly different using the criterion of $p < .05$. Three case discussion participants were not given a matched case during their interviews and are therefore excluded from this analysis.

†For each participant, the content area of this case matches the content area that was covered during the participant's training session; the matched case for case discussion participants was randomly selected from the cases covered in their training session.

Table 4: Unmatched † Case Averages

	Issues	Perspectives	Solutions	Average
Role-Play (N = 13)				
Mean	3.27	3.15	3.35	3.26
SD	1.27	.77	1.07	1.03
Case Discussion (N = 13)				
Mean	3.38	3.38	3.19	3.32
SD	.55	.58	.80	.64
Effect Size				

	Issues	Perspectives	Solutions	Average
D	−.11	−.34	.17	−.07

Two-tailed *t*-tests indicate that none of the group means are significantly different using the criterion of $p < .05$. Three of the role-play participants attended two role-play sessions; as the intent of the unmatched case analysis is to explore how the number of content areas covered (1 in role-play versus 3 or more in case discussion) might impact case analysis performance, these three participants are excluded from this analysis.

†For each participant, the content area of this case is different than the content area(s) encountered during the participant's training session.

Table 5: Untrained Student Averages

	Issues	Perspectives	Solutions	Average
Untrained (*N* = 11)				
Mean	3.09	3.09	2.64*	2.94
SD	.63	.58	.60	.62
Effect Size				
D	.37	.32	.86	.52

Effect sizes in this table represent the difference between the untrained group and the combined role-play and case discussion groups (unmatched case analyses).

*This value was significantly different from the combined group mean (two-tailed *t*-test using the criterion of $p < .05$).

Discussion

Compared with case discussion students, role-play students performed roughly as well on case analyses involving both matched content (same content area as was covered in the training session) and unmatched content (different content area(s) than what was covered in the training session). This finding is important because, whereas our case discussion students covered three content areas during the training session, the role-play students covered only one. This result suggests that either (1) neither type of training significantly affected students' ability to analyze a case, or (2) both types of training were equally effective at preparing students to analyze a case. With either possibility, we can infer that the role-play experience does not apparently harm the participant's ability to analyze cases.

The interviewed role-play and case discussion students performed significantly better in proposing solutions than the untrained students. This difference might be attributed to the significant difference in the students' ages: the untrained students were younger and had completed fewer years of graduate study than the other interviewed students. Consequently, the untrained students had had fewer life experiences on which to draw when they tried to devise solutions to the RCR cases.

OVERALL CONCLUSIONS, LIMITATIONS, AND SUGGESTIONS FOR FUTURE RESEARCH

The results of our summative assessment suggest that role-playing is a viable method for teaching students RCR content and for fostering an appreciation for RCR. Compared with case discussion students, role-play students in our study made qualitatively different statements regarding their training experience; these statements indicate that role-playing might promote a deeper

appreciation of RCR, shifting the focus away from wanting to simply "know the rules" for how to conduct ethical research and towards an understanding that interpersonal factors often make these rules difficult to apply.

There are some important limitations in the current research that merit discussion. First, with regard to participants' case analysis performance, we did not find any significant differences between the role-play and case discussion samples. Few of the interviewed students had received any previous RCR training besides the brief role-play or case discussion sessions, and we cannot expect that a single brief intervention would produce a large improvement in the moral reasoning skills that are needed to analyze a case. However, we hope that future research will address whether participation in multiple role-plays over a period of time is an effective method for improving students' moral reasoning skills. Our results suggest that, if learning did occur as a result of training, the number of content areas covered during training did not substantially affect case analysis ability.

Secondly, although many of our interview results suggested to us that the role-play students might receive higher scores on the Appreciating Perspectives and Proposing Solutions case discussion scoring criteria, we did not find this result. In guiding the students through their case discussions, we had the impression that many of them were unsure of what each of the case discussion questions was intended to measure (What are the issues?; Describe the various viewpoints; What would you propose as a solution?) and that it was not clear to the students how exhaustive their responses should be; as a result, we presume that this led many students to give very brief and unfocused, "satisfactory," responses to each question which were not truly representative of their abilities. We speculate that if the questions had been more specific (for example, Describe the viewpoints of the main parties; if there are any other viewpoints that might be important to consider, describe those as well), it would have conveyed more information to the students regarding what they should talk about; this likely would have given us a clearer indication of any differences between the two groups.

Thirdly, the small sample size limits our ability to make strong conclusions. Despite the small sample size, however, we did find the students' interview responses to be particularly informative of many of our research questions. Although interview and case analysis methods are time-consuming, our results and suggestions for refinement of these protocols can help guide future investigations to more efficiently target specific research questions, thus reducing the amount of time needed to conduct each interview and allowing for larger-sample investigations.

A fourth limitation of our investigation pertains to the age difference across the three samples. Although by design we expected that the untrained students would be younger than the role-play and case discussion students, we did not anticipate that the role-play students would be significantly older, on average, than the case discussion students. In interpreting the interview results, we should also consider the extent to which age could impact the self-reported lessons learned during a case discussion or role-play or the value that a student places on different forms of learning. However, when we looked within the role-play sample for age differences in types of responses students gave, we did not find any reason to conclude that the older students contributed disproportionately to our interview conclusions. For example, it was not just the older of the role-play participants who appreciated the opportunity to rehearse addressing a problem or who commented on the importance of gathering information and appreciating others' perspectives. We believe that the results are very telling of the types of outcomes we might expect from participation in a role-play.

Finally, conclusions from our study are derived from research conducted at a single institution. We did also interview five students at a collaborating university who participated in a role-play. Although this university, which is a private historically Black institution in a large urban setting, differs in many ways from our sample, we found that their reactions to the role-play experience were very similar to those made by the students in our primary study. This provides us with a preliminary indication that students' reactions to the role-play method might generalize to other populations of graduate students. We also find it interesting and worth noting that the three students who participated in both types of sessions did not recall any of the details of the case discussion.

We encourage researchers to continue to investigate the use of role-plays for teaching RCR issues. Our results suggest that students can benefit from the opportunity that role-playing provides to not only consider an RCR issue, but also to rehearse strategies for how they might approach the issue. This opportunity to rehearse contributes uniquely to our conception of what a comprehensive RCR education might entail.

AUTHOR CONTRIBUTIONS

Seiler and Brummel delivered RCR training sessions, contributed to the development of the interview and case analysis protocols, conducted interviews, collaborated in developing the BARS scoring rubric, coded interviews, scored case analyses, conducted data analyses, and drafted part of the manuscript. Anderson contributed to the development of the interview and case analysis protocols, conducted interviews, and collaborated in developing the BARS scoring rubric. Kim conducted interviews, collaborated in developing the BARS scoring rubric, coded interviews, and scored case analyses. Wee conducted interviews, coded interviews, conducted data analyses, and drafted part of the manuscript. Gunsalus was involved in the overall design of the project, delivered RCR training sessions, collaborated in developing the BARS scoring rubric, and provided a critical review of the manuscript. Loui was involved in the overall design of the project, delivered RCR training sessions, contributed to the development of the interview and case analysis protocols, collaborated in developing the BARS scoring rubric, and drafted part of the manuscript.

APPENDIX A: PEER REVIEW ROLE-PLAY ROLES

Professor Role

What follows is an outline of your role. You will need to improvise to some extent-—be creative, but try to stay within the bounds of what seems realistic.

The executive editor of the Journal of Wondrous Research has asked you to review a manuscript submitted for publication in the journal. For this journal the review process is single-blind, so you know that the manuscript comes from the laboratory of your rival S. A. Wong at Desert State University. In glancing through the manuscript, you discover that although the theoretical ideas are novel and promising, the manuscript has numerous flaws: the description of the experimental method looks internally inconsistent, the illustrations lack labels, and the statistical analysis appears to be incorrect.

You want to refer the manuscript to your third-year doctoral student, to give the student experience in reviewing a manuscript (under your supervision) because reviewing is an important professional duty. This manuscript seems like a good opportunity because it demonstrates many potential mistakes that can be made in writing up research results. In addition, you think that two theoretical ideas in the Wong manuscript might help your student overcome some obstacles that have blocked the student's progress for the last three months. The first idea indicates that your student's current approach is not likely to succeed, and the second idea suggests a better direction for your student's research.

This morning you sent a brief e-mail message to your student about the Wong manuscript, and you asked the student to come to your office in the afternoon. The message stated:

[We should meet this afternoon to discuss a new manuscript from the Wong laboratory. I would like to discuss having you review the manuscript for publication, and I also think that some of the ideas in the paper may be useful to help you advance your research.]

You plan to ask the student to serve as the reviewer of the manuscript as part of the student's professional development. You also plan to suggest an experiment to check whether the theoretical ideas might overcome the student's obstacle. You reason that although you are obligated to keep the identity of a peer reviewer confidential, the ideas themselves are not confidential; in fact, you had previously speculated that the theoretical ideas might be true.

You are confident in the abilities of your doctoral student. In many ways, the student is a good role model: the student always takes your advice seriously and implements your ideas diligently.

Student Role

What follows is an outline of your role. You will need to improvise to some extent-—be creative, but try to stay within the bounds of what seems realistic.

You are a graduate student in your third year of graduate study. You have completed most of the course requirements and passed the doctoral qualifying examination. Because you plan to pursue an academic career, you are looking for ways to gain experience with professional service duties such as reviewing manuscripts for publication.

You have worked steadily on your doctoral research project, making good progress. For the last three months, however, you have been unable to overcome an obstacle in your project. Although

you feel frustrated, your research adviser has been supportive and has expressed confidence in your abilities.

This morning you received a brief e-mail message from your research adviser, who asked to see you in the afternoon. The e-mail stated:

[We should meet this afternoon to discuss a new manuscript from the Wong laboratory. I would like to discuss having you review the manuscript for publication, and I also think that some of the ideas in the paper may be useful to help you advance your research.]

You know that Wong and your adviser are competitors in this research area, and you have systematically read the published papers from Wong's laboratory. You are familiar with their work, and some of it has been useful to your dissertation research. You check the Wong laboratory's public Web site weekly to make sure that you know of any developments that might affect your work; however, you did not see a preprint of the new manuscript posted there.

You recently attended a session on responsible conduct of research that highlighted ethical obligations in peer review. You wonder whether it is appropriate to take advantage of ideas in an unpublished manuscript. You also wonder if you can objectively review a manuscript that has ideas useful to your current dissertation work. You have never previously contradicted your adviser, whose ideas have advanced your research. In fact, you are somewhat intimidated by your adviser, whose research insights and judgment have nearly always been correct—and much better than your own intuitions.

APPENDIX B: INTERVIEW PROTOCOL

Interview Protocol: Case Discussion and Role-Play Participants

1. Background Info   (10 min.)

a.   Complete background information sheet

b.   Who are you?

      1.   Verify department

      2.   Verify year

      3.   Career goals

c.   Research experience

      1.   How long?

            i.   Did you do any research before grad school?

      2.   What type?

2. Session Info

a.   Verify which training session was attended (Role-play or case discussion? Who delivered it? What department sponsored it?).

b. Topics covered

1. (Role-play) Which role-play topic did you cover? Which role did you assume (professor/student/observer)?

2. (Case discussion) How many cases did you discuss?

3. Training Evaluation   (15 min.)

a. We would like to know about your reactions to the role-play/lecture.

1. Did you like the overall experience? Why or why not?

2. Did you find the overall experience useful? Why or why not?

b. We would also like to assess how much you remember from the role play/lecture.

1. How well do you think you remember it?

2. Describe the role play and what happened.

i. What were the issues involved?

ii. What solutions were suggested?

3. Did the overall experience change your views on research ethics? How?

i. Did the experience help you to understand the reasons behind why there are research standards?

ii. Did the experience change your views on what it means to be a good researcher or what it means to do good research?

c. We would like to know what you did following the role-play/lecture.

1. Did you have any discussion about the event or the topic later?

i. What did you discuss? Just that you did it or in more depth?

2. Did you use the resources that we provided at all? How?

3. Have you had any opportunity to use the information/skills that you learned from your session? How?

i. Have you applied any of the information/skills in order to avoid or help resolve any issues?

ii. Has what you learned led you to notice any ethical dilemmas in your own or others' research?

d. Have you had any previous ethics training prior to or following our session? If so, what was it?

a. First Experience

1. When was it?

2. What was it for?

3. How long did it last?

4. How well do you remember it?

b. (Second Experience)

1. When was it?

2. What was it for?

3. How long did it last?

4. How well do you remember it?

• You've done research with human subjects/animals/hazardous materials? Have you completed the IRB required training modules?

• Have you completed any other necessary departmental training requirements or training required by a grant funding agency?

e. Was the session as valuable as other methods of ethics training? Why?

1. (if relevant) What about in comparison to the other ethics training you mentioned? Why?

4. Case Analysis (one similar, one novel case topic) (25 min.)

a. Read through the following scenario.

b. Please talk about your impressions of the case, specifically:

1. What are the issues?

2. Describe the various viewpoints.

3. What would you propose as a solution?

i. What problems might occur in resolving these issues?

c. Read through the following scenario.

d. Please talk about your impressions of the case, specifically:

1. What are the issues?

2. Describe the various viewpoints.

3. What would you propose as a solution?

i. What problems might occur in resolving these issues?

e. Do you think either of the cases you just read was easier to analyze than the other? Why?

APPENDIX C: PEER REVIEW CASE FOR CASE ANALYSIS

Professor John Slater is supervising a research project conducted by Alice Parker, a graduate student in Slater's lab. Parker is trouble-shooting a protein purification protocol; she wants to use the protocol to purify a recombinant form of a mammalian protein growth factor expressed in bacteria. Parker needs the purified protein to complete the final experiment required to prove her experimental model. Parker and Slater intend to submit a manuscript based on this model to The Journal of Cool Results.

While Parker is trouble-shooting the protocol, The Journal of Cool Results sends Slater a manuscript to review; he is asked to return the manuscript with his comments and recommendation for publication. The manuscript turns out to be from a competitor's lab, and the title indicates that the work closely resembles the work Parker and Slater intend to publish.

Slater considers the situation. He decides that he can be objective in his review, and he proceeds to read and evaluate the manuscript. After his initial review, he asks Parker for her comments on the manuscript, as the work falls within her field of expertise. Slater and Parker agree that the data are not convincing and that the paper should not be accepted for publication. Slater returns the manuscript to the editor of The Journal of Cool Results, with his recommendation that it not be accepted for publication.

After reviewing the manuscript, Slater and Parker note that the authors use a recombinant form of the protein growth factor that they purified from yeast using a novel technique. Slater suggests that Parker apply this technique to her purification protocol. The revised protocol works well, and Parker is able to complete the final experiment.

Case is taken from: Online Ethics Center for Engineering. (2006). To Review or Not—Reviewing the Competition. Washington, DC: National Academy of Engineering. Available at http://www.onlineethics.org/Resources/Cases/review.aspx. Last accessed 25 May 2011.

Notes

This research was initiated while all of the authors were affiliated with the University of Illinois at Urbana-Champaign.

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