CALL FOR PAPERS | Teaching and Learning of Professional Ethics

Video laboratories for the teaching and learning of professional ethics in exercise physiology curricula

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Senchina DS. Video laboratories for the teaching and learning of professional ethics in exercise physiology curricula. Adv Physiol Educ 35: 264–269, 2011; doi:10.1152/advan.00122.2010.—Student researchers in physiology courses often interact with human subjects in classroom research but may be unfamiliar with the professional ethics of experimenter-subject interactions. This communication describes experiences related to an interactive video used in exercise science and general biology courses to help students become aware of, sensitive to, and comfortable with implementing professional ethics into their own thinking and behavior as researchers before entering the laboratory. The activity consisted of a filmed exercise physiology experiment complemented with interactive question sheets followed by small- and large-group discussion and culminating with individual student reflections. Student written responses from multiple courses indicated that students were able to 1) identify and consider the ethics of experimenter-subject interactions from the movie, 2) generalize broader ideas of professional ethics from those observations, and 3) consider their observations in terms of future experiments they would be conducting personally and how they should interact with human subjects. A majority of students indicated a positive reaction to the video and identified specific aspects they appreciated. It is hoped that this report will encourage other instructors to consider the use of interactive videos in the teaching and learning of professional ethics related to their courses.

biology; experimenter-subject interactions; interactive; kinesiology; videotape

EXERCISE SCIENCE TEACHING LABORATORIES often represent the first experience undergraduate students have as investigators in genuine human subject research contexts. Understandably, students are largely unfamiliar with the principles and procedures related to such work, including ethical aspects like informed consent and the Belmont principles or associated legal aspects. Instructors are thus uniquely positioned (and obligated) to educate students on ethical conduct and practices specific to the field; however, too often such lessons are not conducted.

Video instruction offers an ideal vehicle to introduce and discuss ethical concepts associated with human subjects (11, 26, 31) and has many pedagogical advantages over other choices such as didactic instruction, paper cases, or role-playing simulations (22). Videos stimulate learners both aurally and visually (20, 30) and allow students to be vicariously immersed in real-life scenarios rich with dynamic verbal and nonverbal human interactions and multiple perspectives (4, 6, 24, 27, 31), which are absent in didactic instruction or paper cases (22, 33). Students can consider scenarios through their own viewpoints and not the instructors’ (6, 19, 26). Segments can be paused or replayed, in contrast with real-time situations (24, 28). Prepared videos avoid the student embarrassment associated with spontaneous “role-playing” techniques and may allow for more candid discussions by students (22). Finally, educators have noted videos are a familiar and enjoyable medium for the current media-engaged generation (7, 23).

Pragmatically, videos have additional advantages, including that they can be easily made by the instructor at low to no cost (15), can permit whole classes of students to vicariously experience situations that would otherwise be logistically impractical or unethical (4, 8), can be efficiently and quickly deployed (33), and may allow for consistency of instruction across course sections (21). Positive outcomes associated with video instruction may be found in medical education reports. Some relevant examples include training in interpersonal skill development (27), such as communication (11, 22), empathy (3, 29), and professionalism (2, 13); technical skill development, such as surgery (4, 15, 35) or use of informatics (25); or tasks that require a combination of the two skill types, such as diagnosis/examination (17, 21) or an emergency response (1).

This article shares outcomes associated with the use of an interactive “video laboratory” (an actual experimental session that was filmed and then later presented to students in a classroom setting before students interacted with human subjects in a laboratory setting) to teach human subject research interactions to undergraduate students. An example video and its implementation are described, and students responses to and perceptions of the experience are reported.

Description of the Activity and Student Outcomes

Drake University is a private master’s level university with ~3,000 undergraduate students. Specific courses from which the data in the article were derived encompassed students from freshmen to seniors and included three 3-credit lecture + 1-credit laboratory courses (Bio 133/133L “Kinesiology,” Bio 134/134L “Exercise Physiology,” and Bio 1/1L “General Biology for Non-Majors”), one 3-credit combined thematic writing/ experiential learning course on running (FYS 29 “Running: Body, Mind, Sole”), and one 1-credit introductory seminar (Bio 15 “Introduction to Biology”). Permission to collect, analyze, and present these findings was granted by the Drake University Institutional Review Board (IRB) (IRB ID 2010-11010) congruent with contemporary recommendations (12).
The video was intended to improve students’ awareness of and sensitivity to professional ethics and was thus typically shown in the first couple weeks of the course. For the example described below, 100 min (two 50-min class periods) was allotted in all five courses. The activity consisted of 15 min of preface, 35 min of video viewing, 15 min of small-group work time, 20 min of large-group discussion, and 15 min of individual student reflections. The value in using multiple pedagogical modes in conjunction with videos has been elaborated elsewhere (18).

Activity preparation. Preparation for the activity consisted of developing a video for students and constructing interactive documents for use during (to guide student observations while watching the video) and after (to stimulate reflective and application of the knowledge) the viewing. Selected videos should emphasize experimenter-subject interactions over technical or scientific aspects (although both should be presented). Written consent must be obtained from all parties involved, and IRBs typically wish to review the appropriate waivers before any filming. Videos need not be identical to situations that students will encounter so long as the video allows for a discussion of experimenter-subject interactions. Those videos demonstrating scenarios slightly different from what students encounter force students to expand their understanding of the scope of the field and to focus on the actual concepts underlying research ethics. Further suggestions for selecting or producing videos have been provided elsewhere (9, 15, 16, 19, 34).

Still shots from the video used in this report are shown in Fig. 1. The purpose of the real-life experiment that the video was produced from was to examine the effects of different beverages/foods on temperature regulation, fluid retention, and exercise performance during recovery stages subsequent to exercise in the heat (32). Briefly, subjects cycled in a heat chamber (40°C, 60% relative humidity) until 2.75% loss of body weight, were then rehydrated over the course of 2 h with treatment amounts equal to the volume of fluids lost, and next performed 30 min of steady-state cycling at 70% peak O₂ consumption (V˙O₂ peak) followed by a time trial equivalent to work performed during 30 min cycling at 70% V˙O₂ peak. Data collected during the trials included subject responses to subjective scales (including affect, rate of perceived exertion, and thirst) and mental math problems (Fig. 1A), measurements such as heart rate, blood pressure, and multisite core temperature including rectal thermometry (Fig. 1B), and biological samples such as sweat, blood, urine, and breath samples during exercise. The study protocol lent itself well to a video on professional ethics because it showcased multiple ethical scenarios within the same experiment (moderate risk, constant experimenter-subject interactions over a prolonged period, intense exercise where the subject becomes fatigued, and multiple types of data collection including invasive biological sampling). Although the actual experiment consisted of multiple trials per subject, only one session was filmed and collapsed to a video of ~35-min run time.

Three interactive documents engaged students throughout the lesson. The benefits of punctuated, interactive viewing (versus passively watching a film) have been discussed elsewhere (14, 30). Two of these documents were developed for use during the video. The first document (the “Guided Question Sheet”) focused strictly on experimenter-subject interac-

Fig. 1. Still shots representing the video used in this experiment (see the text for a description of the procedures). A: subject responding to mental math problems with overlaid text for students. B: measuring vitals with overlaid text. HR, heart rate (in beats/min); oral temp, oral temperature (in °C). C: subject posture and experimenter response at the end of the exercise/dehydration period.


Table 1. **Representative items from the Guided Questions Sheet**

<table>
<thead>
<tr>
<th>Scientific/Technical Questions</th>
<th>Ethical Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Phlebotomy</strong></td>
<td></td>
</tr>
<tr>
<td>What is a false tube?</td>
<td>Needlesticks and catheters are disconcerting for many subjects. What are some things that the experimenters can do to ease the subject’s anxiety or discomfort?</td>
</tr>
<tr>
<td>If this is a dehydration study, why flush the catheter with saline after each draw? Isn’t that putting fluids back INTO the body?</td>
<td>Suppose the subject reports that they’re nervous about the amount of blood being taken. How should the experimenter respond?</td>
</tr>
<tr>
<td>What safety measures are in place for both the subject and experimenters?</td>
<td></td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td></td>
</tr>
<tr>
<td>Why is it important to weigh the subject nude throughout the study?</td>
<td>Measurement of nude weight is potentially embarrassing. What procedures are in place to protect subject confidentiality AND get the most accurate data possible?</td>
</tr>
<tr>
<td>What items does the subject still retain on his body during weighing?</td>
<td></td>
</tr>
<tr>
<td><strong>Core temperature</strong></td>
<td></td>
</tr>
<tr>
<td>Why choose to assess core temperature rectally versus other traditional options such as oral or tympanic?</td>
<td>What ethical concerns are associated with rectal thermometry?</td>
</tr>
<tr>
<td>How is the length of the rectal thermometer cord managed during exercise on the bike and moving from one location to another?</td>
<td>A new core temperature “pill” has recently been developed that subjects can ingest (and later void) that measures core temperature. What advantages and disadvantages might come from using the pill instead, both ethically and scientifically?</td>
</tr>
<tr>
<td><strong>Subject responsiveness</strong></td>
<td></td>
</tr>
<tr>
<td>Observe the subject’s behavior and responsiveness during the dehydration period. What changes as the subject becomes dehydrated? What problems does he have?</td>
<td>Observe the experimenters’ behavior and responsiveness as dehydration progresses. What do they do differently? Why?</td>
</tr>
</tbody>
</table>

subject’s response or the experimenters’ verbalization of the data, and a simultaneous textual representation was overlaid (Fig. 1, A and B). The third and final document (the “Personal Reflection Sheet”) contained three open-response reflective questions, was presented to students at the conclusion of the activity for individual responses, and served the dual purposes of prompting students to apply information and as a barometer of student comprehension.

**Preface and viewing.** The purpose of the activity, expectations of students during and after viewing, and specific things to look for were explained by the instructor first; such anticipatory cues are known to improve student learning outcomes (28, 33). Each student received the Guiding Questions Sheet and Data Collection Sheet before viewing. It is recommended that the instructor walks the class through each item to clarify expectations. Half of the video was played for students on the first day, with 5 min allowed for taking notes afterward before class was dismissed; the other half of the video was played for students on the second day.

**Small-group work time.** After viewing the video, students were given 20 min to complete their responses. During this time, students considered their observations of experimenter-subject interactions and synthesized conclusions about professional ethics (higher-order thinking). Student-generated conclusions formed the basis of the large-group discussion that followed and also impacted on the concluding individual student reflections. No instructor input was given. As one representative example of student outcomes, the most common student responses to the “subject responsiveness” category shown in Table 1 will be considered (n = 88). The average number of student responses on subject and experimenter behaviors was 3.0 ± 1.6 and 3.0 ± 1.3, respectively, across the classes included in the tally. In other words, on average, students were able to identify three distinct behaviors from both the subjects and experimenters during the video clip that were related to the subject’s changing condition. Such observations are important because 1) they represent the students’ ability to interpret subject verbal and nonverbal communication and 2) they lay the foundation for subsequent class dialogue. For “changes in subject behavior,” the most common responses were “subject’s mental faculties down/fewer responses correct” (64%), “tired” (56%), and “agitated/irritable” (40%). For “changes in experimenter behavior,” the most common responses were “investigators more encouraging” (51%), “explained things more/talked louder” (44%), and “more attentive/cautious” (44%), including being more supportive physically or standing by to catch the subject (24%). Even though there was one question about changes in subject behavior and a separate question about changes in experimenter behavior, the majority of students referenced both simultaneously in their written responses.

**Large-group discussion.** A concluding large-group discussion facilitated by the Guiding Questions Sheet allowed students an opportunity to share viewpoints and the educator to elaborate on student responses or point out unmentioned aspects. The bulk of dialogue was (and should be) from the students. Returning to the example discussed in the preceding paragraph, a typical dialogue was for the instructor to help students connect changes in subject behavior to changes in experimenter behavior and then immediately segue that discussion into a broader discourse on the professional ethics of being an experimenter.

Students sometimes became frustrated that there was not a “single correct answer” to the items shown in Table 1. Educators and practitioners recognize that there are multiple, legitimate viewpoints to many ethical issues and that situations are
rarely one dimensional, but students (especially younger students) often struggle to appreciate this. [A report of differences in ethical perceptions between educators and students has been presented elsewhere (5).] Such situations should be viewed as teachable moments. For example, returning to the topic of changes in behaviors, in one class section, some students opined that the experimenters’ behavior changed greatly through such comments as “[the experimenters were] more vocal about what they were doing, making sure they were telling the subject what they were proceeding to do, and more concerned, making sure the subject doing okay” and “the researcher becomes more and more aware that the subject is fatigued and constantly asks how he is doing...they are more gentle with the measurements and there to catch him if he falls.” On the other hand, some students opined that the experimenters’ behavior did NOT change through such comments as “the researchers’ behavior seemed very consistent the whole way through; they consistently put the subject first by asking him a series of questions and making sure the subject was well-informed throughout the experiment” and “the researchers’ behavior did not change during the experiment because they are supposed to remain calm and collected...they were calm and professional in their endeavors; they also did a good job on checking on the subject [throughout].” Superficially, these general responses may seem contradictory when in fact they are complementary because both were true. During the video, the experimenters did become more attentive and hovered closer to the subject (as in the former comments), but they also remained calm throughout and kept the subject first (as in the latter comments). Depending on which aspect of experimenter behavior the student focused on, either response (experimenter behavior did or did not change) was legitimate, and this diversity made for a wonderful dialogue on the importance of experimenter poise and empathy and also the legitimacy of multiple viewpoints on the same situation.

Students often remarked that they “didn’t notice” something that another student mentioned during the large-group discussion. Returning to the discussion of changes in behaviors, certain students tended to perceive verbal cues more than body language cues or followed one experimenter over another. Replaying or freezing the video in certain frames allowed a single moment to be analyzed from multiple vantages. For instance, Fig. 1C shows the slouched and wobbly posture of the subject paired with the steadying hand of one investigator; aurally, the other experimenter is speaking louder, enunciating more clearly, and giving more frequent directions, whereas the subject is barely speaking and is rarely making eye contact. Pausing at frames similar to Fig. 1C allowed for a student-led discussion on what verbal or nonverbal cues subjects might give and how best to respond to those cues. The conclusion of the large-group discussion provided an opportunity for unifying student ideas into a broader “take-home message.”

**Individual Student Reflections**

After the discussion, students were given the Personal Reflection Sheet to complete individually during a quiet 15-min period at the end of the activity. Students were told that only the instructor would see their responses. The first item asked students if their perception of the lesson was “favorable, neutral, or unfavorable” and why. In a survey of 72 students, 62 students (86%) indicated “favorable;” most common responses included that the video clearly demonstrated a good example of professional/ethical experimenter-subject interactions (30%), was “real life” (28%), was a good method for visual learners (24%), was engaging (18%), and was better than a lecture option (13%). Four representative student responses included the following:

1. “This was a great learning tool inside how to conduct a safe and respectful experiment. Gave us ideas about how to deal with subjects in our own experiment, and also showed the class what it is like if we ever [participate] in an experiment.”

2. “There are a lot of parts to [the video] that could potentially be issues of ethical treatment. It was also good to see a real study rather than simply reading about hypothetical scenarios.”

3. “It was something different. Also having to fill out a worksheet while we watched the video made you pay attention more.”

4. “Since we weren’t actually taking part in the experiment it was easier to observe it as an outsider...”

Comments such as the first two serve as a good reminder that human subject research is completely novel to most students entering exercise science teaching laboratories; consequently, instructors need to recognize that behaviors or expectations they take for granted as “givens” need to be spelled out explicitly because they are not automatic for students.

**Table 2. Representative specific student responses to the Personal Reflection Sheet**

<table>
<thead>
<tr>
<th>What Students Identified Learning About Professional Ethics</th>
<th>What Students Identified They Could Apply to Their Own Behavior As Experimenters</th>
</tr>
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<tbody>
<tr>
<td>“I learned that professional ethics are practiced throughout the trials of an experiment. It isn’t just something you can turn on and off; it has to be constant.”</td>
<td>“I am ready for our experiment. I feel like I will know how to make a subject comfortable, because now I feel more comfortable conducting one after watching the video. I know what to expect now.”</td>
</tr>
<tr>
<td>“Professionals do care very much for the subjects’ well-being more than the experiment itself.”</td>
<td>“Overall it is just very important to be as helpful and considerate to your subjects as possible. They are volunteering their time to help you, so make sure to make the study worthwhile and as positive an experience for them as possible.”</td>
</tr>
<tr>
<td>“An unspoken understanding of cooperation must be present...both [subject] and experimenter must have respect for one another in order to be successful.”</td>
<td>“I can be sympathetic to subjects during our study and appreciate them for coming and participating.”</td>
</tr>
<tr>
<td>“I learned that being calm and talking with the subject about the procedure beforehand went a long way in the experiment.”</td>
<td>“I need to be very clear on instructions to subjects and make sure they understand all procedures.”</td>
</tr>
<tr>
<td>“I learned a lot more preparation goes into subject safety planning than I knew.”</td>
<td>“Ultimately just remember the subject comes before the data.”</td>
</tr>
<tr>
<td>“I learned that a lot goes into the preparation of a study in terms of ethics.”</td>
<td>“Just staying calm is one of the best things you can do.”</td>
</tr>
</tbody>
</table>
The second item on the Reflective Question Sheet asked students “What, if anything, did you learn about professional ethics in the context of human subject research from watching and responding to the video?” From the aforementioned sample of 72 students, the most frequent student responses included that they learned about the importance of being “patient” or “supportive”/“comforting” with subjects (44%), nonspecific comments related to keeping the subject a “first priority” (35%), the importance of safety (24%), the importance of privacy/confidentiality (18%), and the importance of appropriate and constant communication (18%). Table 2 (“What students identified learning about professional ethics”) shows some representative student responses.

The third item asked students “Did you see or learn anything from this video that you could apply to your own behavior when you are conducting human subject research?” Since this question did not apply to all classes that the video activity was used in, only responses from those courses with a laboratory component were included (n = 32). The most frequent student responses mirrored those given in the preceding item and included being respectful of the subject and the time that the subject is volunteering (50%), empathizing and being friendly/patient (41%), and communicating frequently and effectively (34%). Student responses to this third question were particularly important because they represented concepts that students were transferring from the video to their own personal circumstances. Table 2 (“What students identified they could apply to their own behavior as experimenters”) shows some representative student responses. These quotations suggest that students could self-identify specific things they learned about ethics in the activity and translate those thoughts into action plans specific to their own future experiments.

Concluding Remarks

The exercise science laboratory/classroom is unique among science learning environments in its use of human subjects. Interactive video laboratories may be a nice prelude to students’ laboratory involvement because such laboratories allow students to critically reflect on experimenter-subject interactions before actual encounters. Critical to this process is dialogue between instructors and students, not only bookending the video but throughout (22, 28, 30, 31, 33). The combination of whole group, small-group, and individual work (18) as exemplified here requires all students to be actively engaged, allows students of various skills and backgrounds to participate, and may help more reserved students participate (6). By allowing students to vicariously experience situations they will encounter before laboratories, videos enable undergraduates to anticipate circumstances (as suggested by the quotations shown in Table 2) and improve self-confidence in their abilities (3).

Although the benefits of video instruction have been emphasized throughout this work, the technique does have limitations and potential misapplications. Simulations need to be authentic throughout this work, the technique does have limitations anticipates circumstances (as suggested by the quotations shown in Table 2) and improve self-confidence in their abilities (3).

ACKNOWLEDGMENTS

Patrick Jennings filmed the experimental session, and Justus Hallam and Patrick McIntyre performed the roles of the experimenters and graciously gave consent to be filmed and have the video shown. The author served as the subject in the video-recorded experiment. Marc Busch helped with the preparation of the figures. Timothy Unness lent the video camera.

DISCLOSURES

No conflicts of interest, financial or otherwise, are declared by the author(s).

REFERENCES