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Regulations and Ethical Considerations for Astronomy Education Research

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Abstract

In this article, we briefly outline and discuss the legal and ethical ramifications of doing astronomy education research, with an emphasis on the practical issues that researchers have to keep in mind when engaging in, and publishing about, research that involves human subjects.

1. INTRODUCTION

Many of us in the astronomy education research community have crossed over from the natural sciences, and the three authors are no exception. In this relatively young community of practice, researchers may not be aware that sociobehavioral research involving human subjects (e.g., instructors, students) is regulated by legal and ethical guidelines designed to protect the rights of, and minimize the risks to, participants. Failure to observe these laws and guidelines may not only put participants in harm's way, but it can also have serious ramifications for the researcher and his or her institution. Serious and continuing noncompliance can affect the researcher and may include the revoking of one's right to conduct research. Becoming aware of the policies in place at your institution will help you to protect both yourself and your research participants. In this article, we will provide a general overview of the relevant laws, regulations, and ethical guidelines in order to inform the growing community of astronomy education researchers.

2. HUMAN SUBJECTS PROTECTION PROGRAMS

Modern human subjects protection programs trace their origin to the Belmont Report (National Commission for the Protection of Human Subjects 1979), which outlined ethical guidelines for research on humans. In this article, we will refer to "participants" or "subjects" as individuals who have agreed to participate in a research study. This report was commissioned after a variety of psychological and medical studies, detailed by Beecher (1966), caused a moral outcry against the exploitation of human participants in research (Jones 1981). Among behavioral science studies, many readers will be familiar with the Stanford prison experiment, in which undergraduates were randomly assigned to roles of guards and prisoners (Haney, Banks, & Zimbardo 1973), quickly leading to abusive behavior on the part of the students acting as guards, and the Milgram experiment, in which participants thought they were delivering increasingly harmful electrical shocks to others in obedience of orders given by researchers (Milgram 2004).

To uphold the Belmont Report's three fundamental ethical principles—respect for persons, beneficence (to do good), and justice—all projects involving human participants are subject to review by an institutional review board (IRB) prior to the initiation of the project or recruiting of participants. This review ensures that the research is ethical and that participants' rights are protected. In astronomical terms, the IRB serves roughly the same "gatekeeper" function as a time allocation committee for a telescope. Just as you, the researcher, are typically not the one to decide whether you are allotted time on a telescope, you, the researcher, are not the one to decide whether your research study with human participants meets your institution's risk assessment guidelines. This determination is made by the IRB at your institution.

3. THE INSTITUTIONAL REVIEW BOARD (IRB)

The role of the IRB is to ensure that research conducted under the auspices of the institution does not impose unnecessary risk to participants, be it physical, psychological, financial, social, or criminal. Each institution from which researchers will be recruiting human participants has a department or service unit that performs this assessment function.

In the case of astronomy education research, physical risk is typically not an issue. Psychological risk, however, can be present if participants feel uncomfortable or threatened by any aspect of the study—for example, when the participant is sharing personal information, beliefs, or behaviors. The IRB assesses potential risks to participants and ensures that the project complies with institutional, legal, and ethical policies and guidelines. Typically, the IRB determines a study to be in any of these three categories: low risk (e.g., collecting an anonymous survey), minimal risk (e.g., audio recording), and greater than minimal risk (e.g., interviews asking participants about criminal behavior). In astronomy education research, projects that carry more than minimal risk are rare. The more risk the project carries to participants, the more stringent the review will be. It is up to each individual IRB to interpret policies and guidelines, with the constraint that the institutional procedures must be at least as stringent as U.S. federal guidelines.

If one wants to conduct a research project involving human participants, it is a good idea to inform oneself of the IRB process by going through a training program on human subjects protection. The training covers ethical aspects of doing research with human participants, including recruitment, informed consent, confidentiality, and privacy. We will discuss these different aspects below.

4. RECRUITMENT

Recruitment of participants is essential in any educational research study. However, before you can recruit individuals to participate in your study, prior approval of your research project from your IRB is needed. This is to ensure that your recruitment procedures follow legal and ethical guidelines and to assess the potential risks to participants.

Some situations (such as when instructors are conducting research and recruiting their students to participate in their study) can be especially tricky to negotiate because the student-instructor relationship involves an inherent imbalance of power (undue influence). Students may feel pressured to participate in a study conducted by their instructor because the instructor has control over their grades, and the student has no a priori way of knowing what the ramifications of not participating will be. This is but one example of potential situations that can muddy the waters of recruitment, but your IRB can help you design your research protocol so that your participants do not feel pressured into participating.

5. INFORMED CONSENT

One issue that the IRB will consider is how consent to participate in the study is obtained. Consent is typically obtained in writing, although the IRB may review a researcher's proposal and determine that consent can be waived. In most cases, individuals must be given the freedom to choose whether to participate in a study. This also means that you cannot film students or take their pictures without their consent. In all cases, however, it is the IRB, not the researcher, that determines the level of consent required.

Consent forms contain the following elements (U.S. Department of Health and Human Services 2005, 45 C.F.R. § 46.116):

- A statement that the study involves research, an explanation of the purposes of the research and the expected duration of the subject's participation, a description of the procedures to be followed, and identification of any procedures which are experimental;
- A description of any reasonably foreseeable risks or discomforts to the subject;
- A description of any benefits to the subject or to others which may reasonably be expected from the research;
- A disclosure of appropriate alternative procedures or courses of treatment, if any, that might be advantageous to the subject;
- A statement describing the extent, if any, to which confidentiality of records identifying the subject will be maintained;
- For research involving more than minimal risk, an explanation as to whether any compensation and an explanation as to whether any medical treatments are available if injury occurs and, if so, what they consist of, or where further information may be obtained;
- An explanation of whom to contact for answers to pertinent questions about the research and research subjects' rights, and whom to contact in the event of a research-related injury to the subject; and
- A statement that participation is voluntary, refusal to participate will involve no penalty or loss of benefits to which the subject is otherwise entitled, and the subject may discontinue participation at any time without penalty or loss of benefits to which the subject is otherwise entitled.

In the case of astronomy education research, not all these components will apply, but this outline is a good place to begin when preparing a consenting document.

Working with minors presents its own set of unique procedures; they are not legally able to give consent and are a specially protected population because of their increased vulnerability to coercion. When working with children, a researcher needs to obtain *permission* from a parent or guardian (similar to obtaining informed consent) and *assent* from the child. Assent is affirmative agreement to participate in the research, the specifics of which will depend on the age and cognitive level of the child (U.S. Department of Health and Human Services 2005, 45 C.F.R. § 46.408).

6. CONFIDENTIALITY AND PRIVACY

A basic right of participants volunteering data in a research study is respect for their privacy and the confidential and conscientious use of their data by the researcher. Depending on your institution's policies, you may need to specify who can gather data, who has access to it, and who is authorized to work with it. As a matter of privacy, only these individuals are entitled to know who is participating in the study and which data belong to a given participant. The data must be kept confidential. At our institution, this means that paper data (transcripts of interviews, written surveys, and so on) must be kept under lock and key, and electronic data should be on a secure password-protected computer. It also means that researchers should not name participants in conversations held in public settings, where they may be overheard. In general, as risk to participants increases, data security should likewise increase.

When working with students, either K–12 or college, an additional consideration is the Family Educational Rights and Privacy Act (U.S. Department of Education 1974), which prohibits the public use of personally identifiable student data. Most of us have had experiences with this, in that you cannot post student grades publicly (e.g., on an office door) organized by name or student identification number. Likewise, it is illegal to collect personally identifiable data, such as student identification numbers or social security numbers, in research studies.

However, in some research designs with students, identifiers are needed to match data (for example, when assessing student learning before and after instruction). An ethical alternative is to ask students for their name and give each student a unique identifier, either a number or a pseudonym; then, when the study is completed, the names can be permanently removed but the matched information is retained with the data. For studies determined to be low risk to participants by the IRB, personally identifiable information may be less of an issue, but this can vary by institution. Ideally, if you do not need personal information for your research, simply do not ask for it.

7. OFF-SITE RESEARCH

Researchers conducting studies at locations other than their own institutions may need to follow additional guidelines. Other institutions, such as schools or communities, may have their own research protocols that researchers must follow, in addition to the policies at researchers' home institutions.

One's home institution may have guidelines for off-campus research as well. For instance, at the University of Arizona, researchers must obtain a site authorization from an authorized administrator from that location indicating that permission has been given to use the location as a research site. Our site authorizations include a statement describing what type of data will be collected and from whom, as well

as a time frame for which the authorization is valid.

8. PERIODIC REVIEW

Projects that are federally funded or those that the IRB has determined are at least minimal risk to participants are reevaluated at least once per year in a process called periodic review. This involves providing the IRB with information about the progress of the study over the course of the year. Although the exact information collected by each IRB may be slightly different, IRBs typically ask for the number of participants enrolled, whether any changes were made to the study, and whether any problems were encountered with the study during the year. You may also be required to file a notification with the IRB when the project is ended, depending on the type of project and institutional policies.

9. PUBLISHING AND PUBLICIZING RESEARCH RESULTS

The aim of doing any research, whether in astronomy or astronomy education, is to add to the knowledge base in a particular area of study. This often involves giving presentations and publishing scholarly papers. With human participants, several restrictions apply in sharing the data with the rest of the world. First and foremost, data and/or results cannot be shared with others unless the study has been approved by the IRB (U.S. Department of Health and Human Services 2005, 45 C.F.R. § 46.408). Second, no personally identifiable information about participants can be used in any presentations or papers without participants' permission. Note that this includes photographs and audio or audiovisual recordings of settings and participants if this means that research data can be traced to individual participants.

10. RESEARCH, EVALUATION, AND DATA MINING

An important distinction is the difference between educational research and educational evaluation. "Research is a process of steps used to collect and analyze information in order to increase our understanding of a topic or issue" (Creswell 2005, p. 3). In contrast, the purpose of evaluation is "the use of social research methods to systematically investigate the effectiveness of social intervention programs" (Rossi, Lipsey, & Freeman 2004, p. 28). Its audience is smaller by design, and evaluation data and results are generally fed back to the key stakeholders of the program, as opposed to the scholarly field at large. Evaluations vary significantly in size and scope. Informal course evaluations for example, in which an instructor asks her students about her teaching in order to improve the course, are quite limited in size and scope. Program evaluations, such as feedback and demographic information collected from participants of a school districtwide professional development workshop in order to report these data back to the funding agency, can be of larger scope, involving many more individuals. The largest program evaluations can encompass data from thousands of individuals across the country or globe.

The ultimate distinction between research and evaluation is the intended use of data and results. If data and results are to be reported only to program stakeholders and not made public, the work falls under the category of evaluation; data collected for the purposes of program or course evaluation generally do not require informed consent nor review by the IRB, although this can vary. "Many evaluations may not make use of an IRB process for a variety of reasons—it may not be required by the funder, [or] the agency may not have established an IRB" (Fitzpatrick 2004, p. 189). In cases such as these, "the ultimate responsibility for the protection of the rights of human subjects lies with the evaluator" (p. 189).

This does not mean that data collected for an evaluation can never be used for research purposes nor published, but IRB approval, and possibly consent from the past participants, will be necessary prior to publication. A key factor for an evaluator to consider when deciding whether IRB approval is necessary is his or her intent for the data. If there is the intent to publicly share results or information from an evaluation, IRB approval is typically necessary because the data are no longer being used solely for evaluation purposes. As soon as your work leaves the realm of evaluation and/or standard educational practice and can be considered research, you must obtain IRB approval.

As always, the IRB determines what constitutes research. In case of doubt, if you are situated in an institution with an IRB, it is advisable to contact them prior to data collection. Needless to say, exploiting the process by requesting retroactive approval for previously collected evaluation data or results that were intended to be publicized all along is a violation of the spirit of the law.

Another particular circumstance that merits discussion is data mining. In astronomy, data mining projects are common. Data collected in one project can be used for other research projects without difficulty (save embargo issues, of course). For example, if you possess HST data under embargo for a specific research project, you can share those data with another researcher who wishes to use them for a different study. In astronomy education research, this cannot be done without specific and separate IRB proposals because participants have only consented to participate in a specific project for a specific purpose.

11. CONCLUSION

We have attempted to paint a picture of what it means to do educational research in an ethically and legally responsible way. Although the process of obtaining IRB approval for a project may seem complex at first, it is the experience of the authors that the IRB is usually very willing to assist. The job of the IRB is to help researchers in their work by ensuring that the ethical and legal issues of a project are well described. The IRB gives the project the institution's seal of approval, which covers the researcher in case legal or ethical issues arise. The IRB is there to help, not to hinder, your research.

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