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FINAL REPORT

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May 13, 2009

Title:
Ethical Decision-Making in the Education of Future Teachers of Science: Exploring Teachers’ Beliefs through Popular Culture Videocases

**Purpose/Background:** An important aspect of teacher knowledge is an understanding of ethical decision-making and how to foster this kind of thinking in secondary science education pre-service teachers and their future students. Ethical decision-making has gained increased importance as citizens wrestle with the complexities and environmental challenges of our 21st century “flattened” world. Yet research indicates that both pre-service and experienced science teachers have fragmented understandings of the ethical decisions surrounding the scientific enterprise. Video case modules based on popular cultural resources such as movies are one of the strategies that have been recommended for helping pre-service teachers design curricula and learning experiences that take into account ethical decisions. In this study we refine and develop popular video cases as a context for studying pre-service secondary science teachers’ ethical decision-making. The study is being conducted in a required curriculum class for secondary science education majors.

**Description of Research Project:** In the first phase of the study we refined a video case module based on the movie “Eight Below.” We audio-recorded students’ focus group discussions of the ethical issues in this movie. We then conducted laboratory activities from the module with the students. For example, one activity involved an exploration of isotopes needed to understand whether a rock material in the movie “Eight Below” was extraterrestrial or terrestrial in origin. In the second phase of the study, student groups selected videos around which to develop their own video case modules. We participated in their planning meetings and class presentation of their final projects. Students selected videos on the basis of their portrayal of ethical dilemmas (i.e., Gattica features issues of cloning and stem cell research, Ice Age II features dilemmas of global climate change; Twister features dilemmas surrounding the human cost of advancing scientific knowledge). We also observed and recorded field notes as students participated in biodiversity surveys and related activities. In the last phase, we individually interviewed students from each of the four groups to deepen our knowledge of their understanding of ethical decision-making in science.

**Data collection and analysis:** We transcribed the student focus group discussions of Eight Below. We audio-recorded and transcribed a curriculum planning session as each group designed their video case. We also analyzed the email planning conversations for each group. The final individual interviews were also audio recorded and transcribed. We developed a rubric based on principles of ethical decision-making found in the literature, and used this to analyze students’ understanding. Accordingly, data for the study consisted of:

- a) Transcripts of student focus group discussions of Eight Below;
- b) Transcriptions of student curriculum planning meetings as they designed their own video cases;
- c) Email planning conversations
- d) Individual student interviews
- e) Artifacts, including students’ curriculum modules

Initial Findings: In our analysis thus far, the majority of statements in the focus group discussions support the idea of students using a utilitarian (i.e., what works-Kantian) approach to the ethical
dilemmas in the video cases. There were several students on the fringe of using a biocentric ethics to approach the dilemmas in the video cases. One of these groups noted being influenced by the reading of Jared Diamond’s “Collapse” to support her ethics, and others mentioned childhood influences. A prevalent term across data sources was a Kuhnian perspective that science is inherently progressive. We are currently in the final stages of analysis.

**Conclusions/Recommendations:** A utilitarian approach to ethical decision-making is, at its best, limited in terms of thinking about today’s complex controversial issues in sciences. The video case experience was a starting point in moving towards a more biocentric ethics, but more remains to be done. The fact that the majority of the students’ view science as inherently progressive (consistent with Thomas Kuhn’s modernist paradigm) presents challenges for science teacher educators and classroom teachers. Students may be unaware of or ignore the ways in which scientific knowledge can be misappropriated and used in ways which are harmful to humans and the environment. For the most part, it was clear that the majority of pre-service science teachers in this study had never considered ethical decision-making as a component of learning to teach science. We recommend:

*making ethical decision-making a central part of pre-service science education and other STEM courses
*continuing the development of useful curricula materials as a centerpiece for fostering students’ understanding of ethical issues
*investigating citizen science as one approach to fostering students’ ethical thinking.

**Dissemination:** We are in the process of developing two proposals to present this study at national conferences:

*a proposal to the Association of Science Teacher Educators (ASTE) due June 30th
*a proposal to the National Association for Research in Science Teaching (NARST) due August 1st.

We are developing two articles based on this study:

*an article for practitioners featuring the Eight Below curriculum module to be submitted to The Science Teacher.
*a research-based article describing what was learned from this study to be submitted to Journal of Science Teacher Education.