

THE GRAY WORLD: INTRODUCING RESEARCH ETHICS TO FUTURE PROFESSIONALS IN SCIENCE AND ENGINEERING*

William Frey

Based on *EAC Toolkit - Student Module Template*[†] by

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Abstract

This module reports on an outreach project carried out in conjunction with GERESE, Graduate Experience in Research Ethics for Science and Engineering (NSF 0629377). In this project, graduate student mentors developed and presented a workshop in research ethics targeted to pre-university students interested in careers in science and engineering. Students learn to see that a career can be good in two senses, a moral sense and a technical or discipline-based sense. This and other modules are also featured in an EAC Toolkit developed through the NSF-funded project, "Collaborative Development of Ethics Across the Curriculum Resources and Sharing of Best Practices," NSF-SES-0551779.

HOW TO EDIT: Write your module for a student audience. To complete or edit the sections below erase the provided textual commentaries then add your own content using one or more of the following strategies: **Guide to Links**

- Faculty Retreat in Research Ethics summarizes NSF grant GERESE activities.
- RISE2BEST link provides links to other sources essential to research ethics: Online Ethics, ORI, and selected universities
- Ethics CORE is a new NSF project to create a comprehensive online center to draw together materials on research ethics like Online Ethics Center and U-Mass Scholarly Works/ESENCE project

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[†]<http://cnx.org/content/m14291/1.9/>

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- Open Seminar course is online component of a special topics course in Research Ethics offered at UIUC in 2008.

1 Graduate Experience in Research Ethics for Science and Engineering

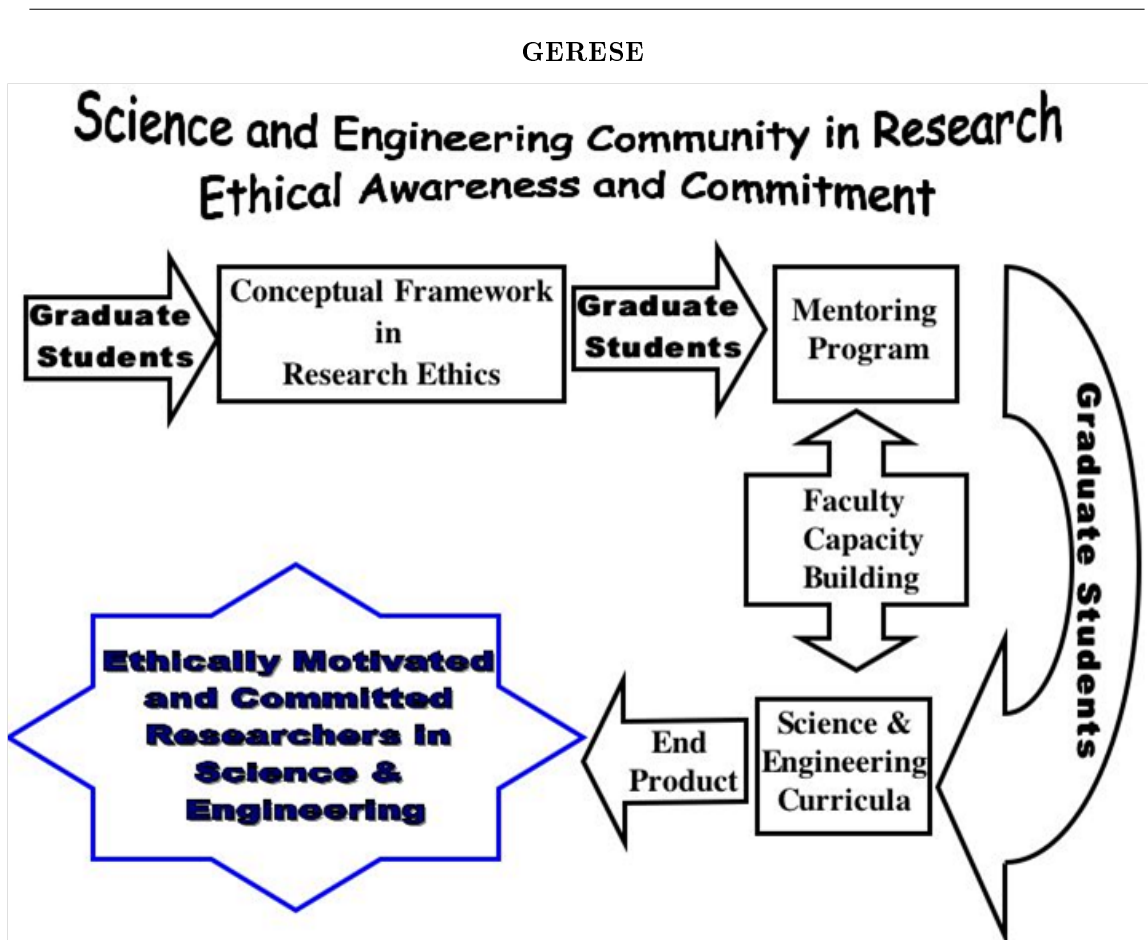


Figure 1: Elements of GERESE project leading to ethically empowered graduate students.

GERESE, an NSF grant, developed and tested a hybrid approach to research ethics, one that sought to identify and integrate synergies between stand-alone courses and an organized series of ethics across the curriculum interventions. Working with a conceptual framework in research ethics, where issues are derived from a double axiological axis, project investigators developed a workshop series in research ethics and also experimented with one-hour and three-hour courses. Faculty development workshops identified key issues in research ethics and carried out activities through which faculty members assessed different aspects of GERESE. A final retreat held August 2009, realized module and case development activities which were

mapped onto the research ethics issues identified earlier. The result is an Ethics Incubator published in the Connexions module, "Faculty Retreat in Research Ethics—Modules and Issues. (See link above.)

2 A Presentation: The Gray World

Graduate students at UPRM, Erika Jaramilla and Morgan Echeverry, developed a presentation that introduces students to general ethical issues as well as more specific issues in research ethics. This presentation introduces ethics in the context of choosing a career; ethics consists of the proper exercise of choice in this and other situations. Student-produced video vignettes used to introduce key issues in research ethics have been seamlessly integrated into this presentation. Using clear images and forceful descriptions, this presentation introduces pre-university students to a range of ethical issues that arise in research in engineering and science. Several distinct pedagogical strategies are used to bring about a transition from black and white situations (which help students hone in on key concepts and distinctions) to the "grey world" where students are exposed to real world moral complexities.

The Gray World—Presentation in Spanish

[MEDIA OBJECT]¹

Gray World Presentation for Graduate Students

[MEDIA OBJECT]²

Gray World Presentation (SEAC Nov 5, 2011)

[MEDIA OBJECT]³

3 Research Ethics Video Vignettes

Students act out different scenarios in research ethics to provide black and white examples of different issues. Among those covered are plagiarism, falsification, fabrication, environmental responsibility, mentoring, and conflict of interest.

Fabrication

¹This media object is a downloadable file. Please view or download it at <http://cnx.org/content/m37142/1.7/presentacion_Junio_2008.pptx>

²This media object is a downloadable file. Please view or download it at <http://cnx.org/content/m37142/1.7/Charla_UPR-Aguadilla_2011.pptx>

³This media object is a downloadable file. Please view or download it at <http://cnx.org/content/m37142/1.7/SEAC_V2.pptx>

Video Vignette Fabrication

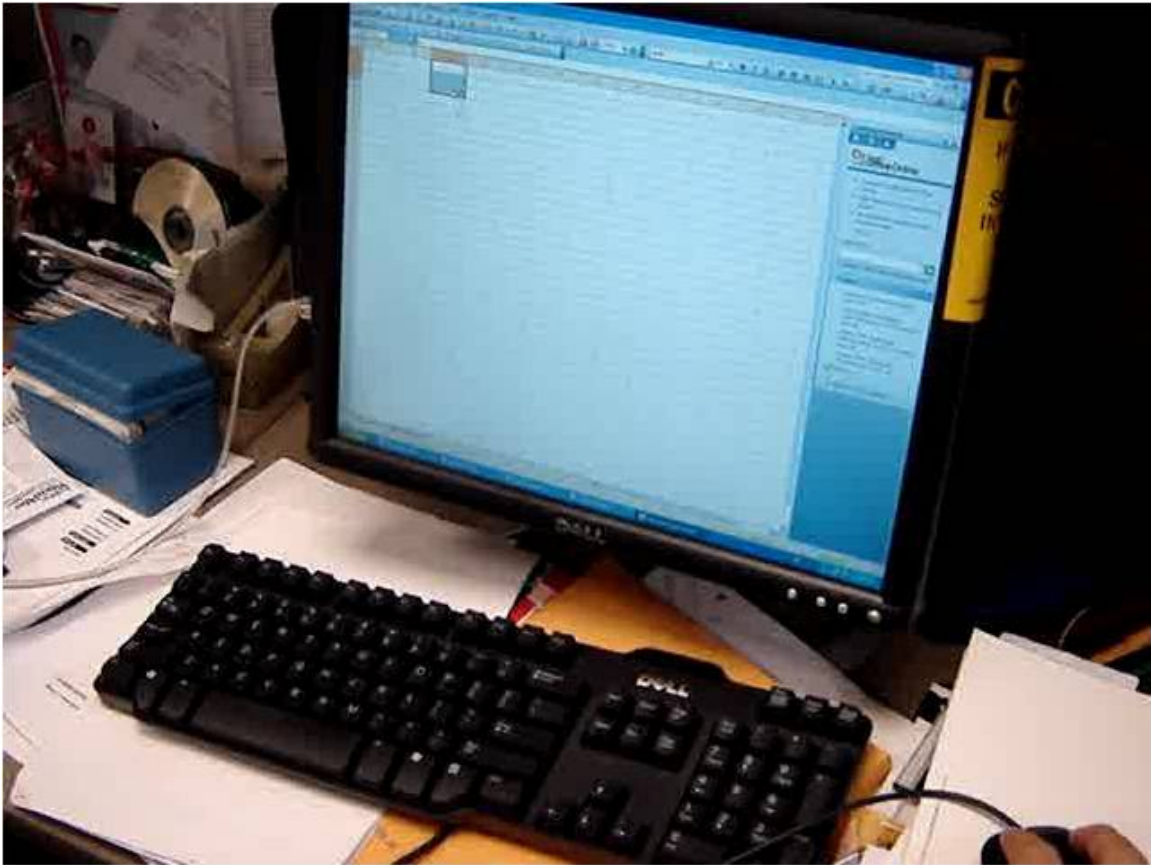


Figure 2: Student fabricates data to make meet teacher's expectations.

Falsification

Falsification

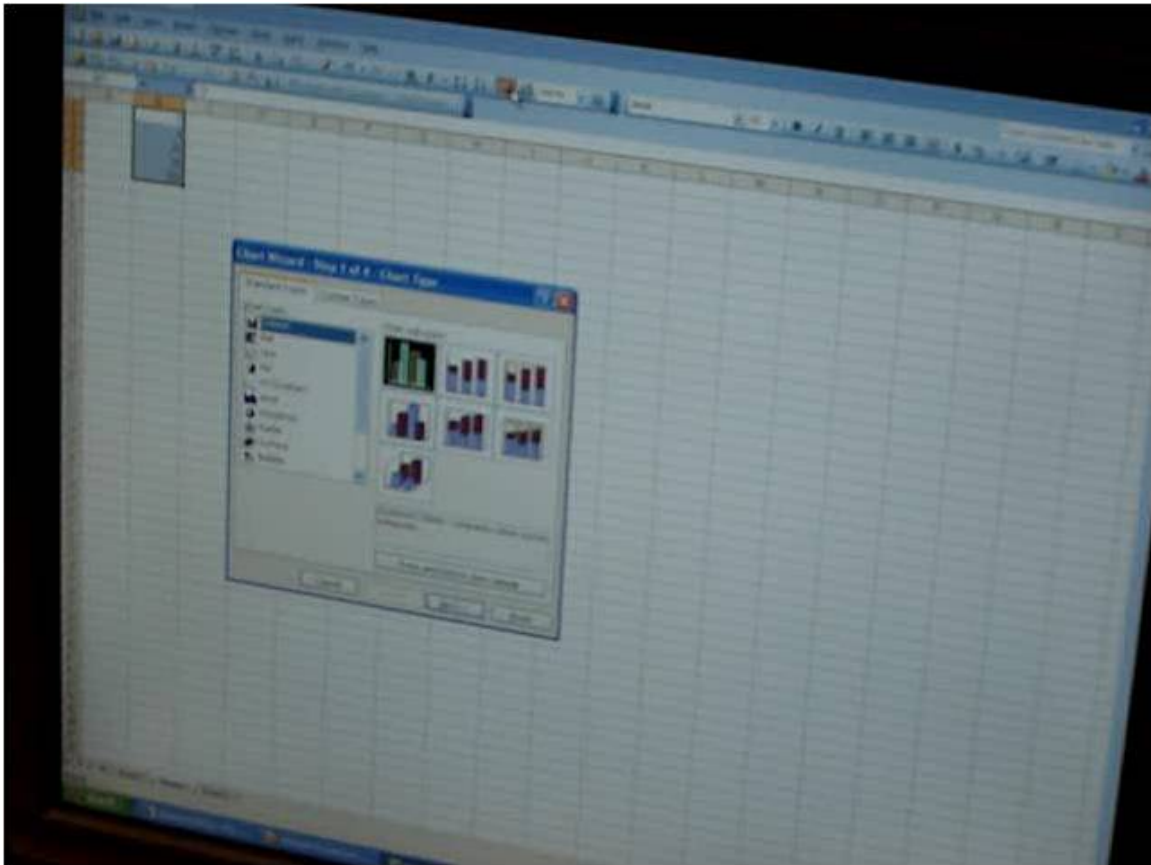


Figure 3: Student falsifies data to make data spread sheet meet teacher's expectations.

Throwing Out the Trash



Figure 4: Car turns corner, window opens, and trash flies out in a graphic display of environmental irresponsibility.

4 Moving from the Black and White to the Gray

A Layered Case

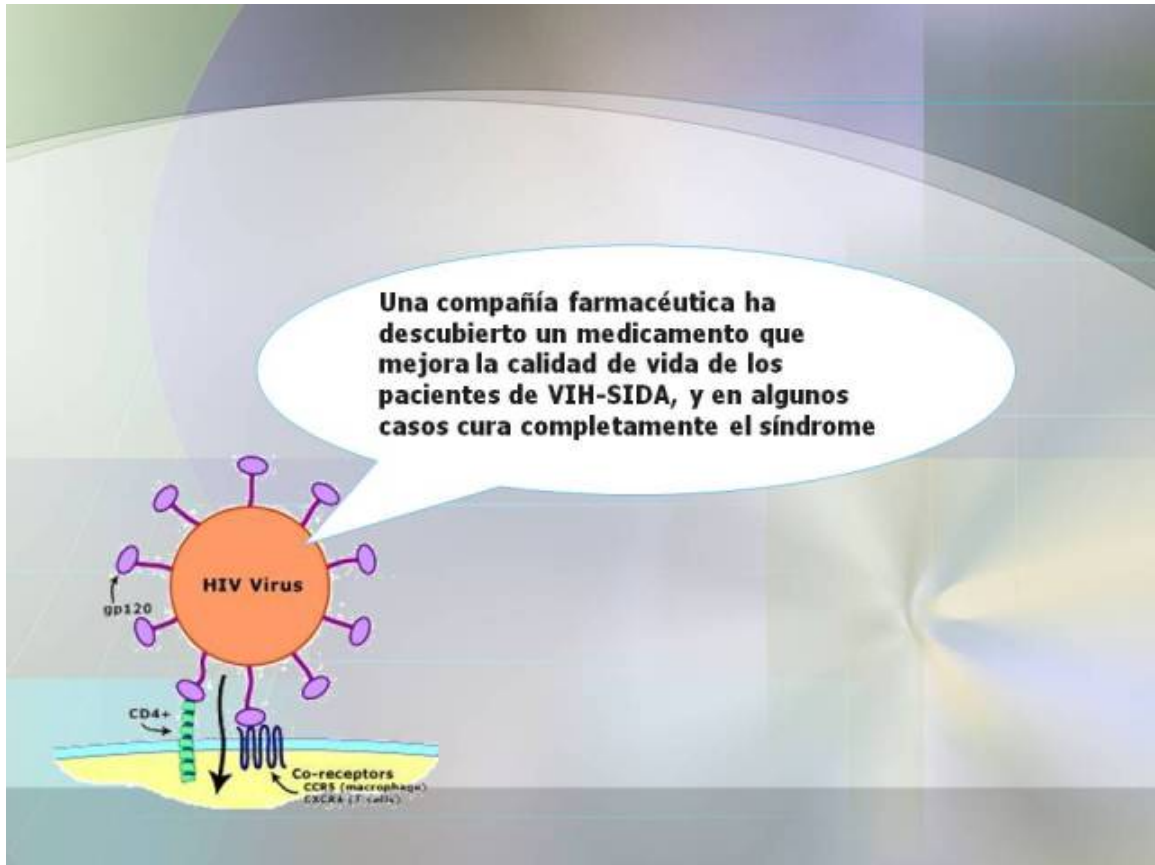


Figure 5: This layered case helped students move from black and white issues to gray issues.

A pharmaceutical company discovers a treatment for HIV-AIDS patients which controls the symptoms and, in some cases, cures the disease

Complicating circumstances are layered in.

- The production process produces toxic chemical byproducts.
- To clean these up properly would cut sharply into the company's profits so it dumps them illegally but temporarily into an aquifer that supposedly nobody uses.
- The medicine works so the company's product saves lives. But is the cost—the contamination of an aquifer—really worth the cost?

5 Assessment Strategy

The assessment strategy used by workshop developers combines qualitative with quantitative assessment. Closed questions help measure changes in student perception and knowledge pertinent to ethics and research

ethics. Open-ended questions help assess problem solving and concept prototyping skills.

Pre and Post Test for Assessment

[MEDIA OBJECT]⁴

Mapping Assessment Activities onto Bloom Taxonomy

[MEDIA OBJECT]⁵

6 Results

Assessment Results

Nombre de la Escuela	Fecha	Núm. part.	Conocimientos	Percepción	Análisis Caso	Concepto Ética	Video	Eval. General del taller
STI-2007	Junio 27 2007	16	26%	19%	NA	NA		NA
UBSM-Ponce	Junio 28 2007	27	26%	16%	NA	NA		NA
CROEM	Marzo 3 2008	19	14%	39%	0.47-1.18	1.5-2.05		90.4%
UBSM-S. Germán 2008	Junio 30 2008	32	24%	30%	0.59-1.45	1.63-1.72		94.7%
STI-2008	Junio 26 2008	18	21%	21%	2.22-2.44	0.23-1.31		90.3%
UBSM-Ponce yB	Junio 17 2008	41	20%	33%	0.56-1.89	1.22-2.17		94.33%
BETTER-IC 2008	Julio 19 2008	32	18%	29%	1.11-1.21	2.42-2.54		83.33%
SESO 2008	Diciembre 8 2008	18	35%	44%	1.5-2.78 1.9-2.33	0.67-1.78 0.76-1.33		78%
Inés María Mendoza	Diciembre 10 2008	38	6%	14%	NA	NA		48.3%
SACNAS	Marzo 25 2008	10	12%	27%	NA	NA		85%
PR.LS-AME	Octubre 21 2008	15	13%	21%	2.43-2.93	1.18-1.91		
Mc Nair	Noviembre 12 2008	11	13%	25%	2.27-2.45	0.75-1.75		
UBSM- Ponce 2009	Julio 2009	25	13%	24%	0.63-1.5	1-1.32	Plagio, falsificación	86.3%
STI 2009	Julio 3 2009	18	7%	25%	2.17-2.61	0.86-1.21		90%
BETTER-IC	Julio 2009	32	26%	30%	0.57-1.33	1.3-1.8	Plagio, conflicto de interés	87.3%
		352						

Figure 6: This table summarizes the assessment results for the 352 students who participated from 2007-2009. These are broken down into ethical perception, ethical knowledge, and rubric graded results on the open-ended definition and case analysis questions.

⁴This media object is a downloadable file. Please view or download it at <[http://cnx.org/content/m37142/1.7/Pre prueba etica 6 agosto 2007.docx](http://cnx.org/content/m37142/1.7/Pre_prueba_etica_6_agosto_2007.docx)>

⁵This media object is a downloadable file. Please view or download it at <[http://cnx.org/content/m37142/1.7/OBJETIVOS ESPECIFICOS modificados 31 de julio de 2007.docx](http://cnx.org/content/m37142/1.7/OBJETIVOS_ESPECIFICOS_modificados_31_de_julio_de_2007.docx)>