

Teaching Nuclear Energy: The Challenges of Interdisciplinarity in the Classroom

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MRU Science

- No dedicated Chemistry or Physics degree
- BSc in Health Science, Molecular Biology, Geology, and General Science
- Limited student population past 2nd year in Chemistry and Physics
- Need for 3rd year General Education courses

Most of the work still to be done in science and the useful arts is precisely that which needs knowledge and cooperation of many scientists and disciplines.

That is why it is necessary for scientists and technologists in different disciplines to meet and work together, even those in branches of knowledge which seem to have least relation and connection with one another.

- Antoine Lavoisier (1793)

Science and Politics

- CHEM 3802
 - Team taught by Chemistry and Policy Studies



Warning for Developers

The compromise will always be more expensive than either of the suggestions it is compromising.

- Arthur Bloch



Science and Politics

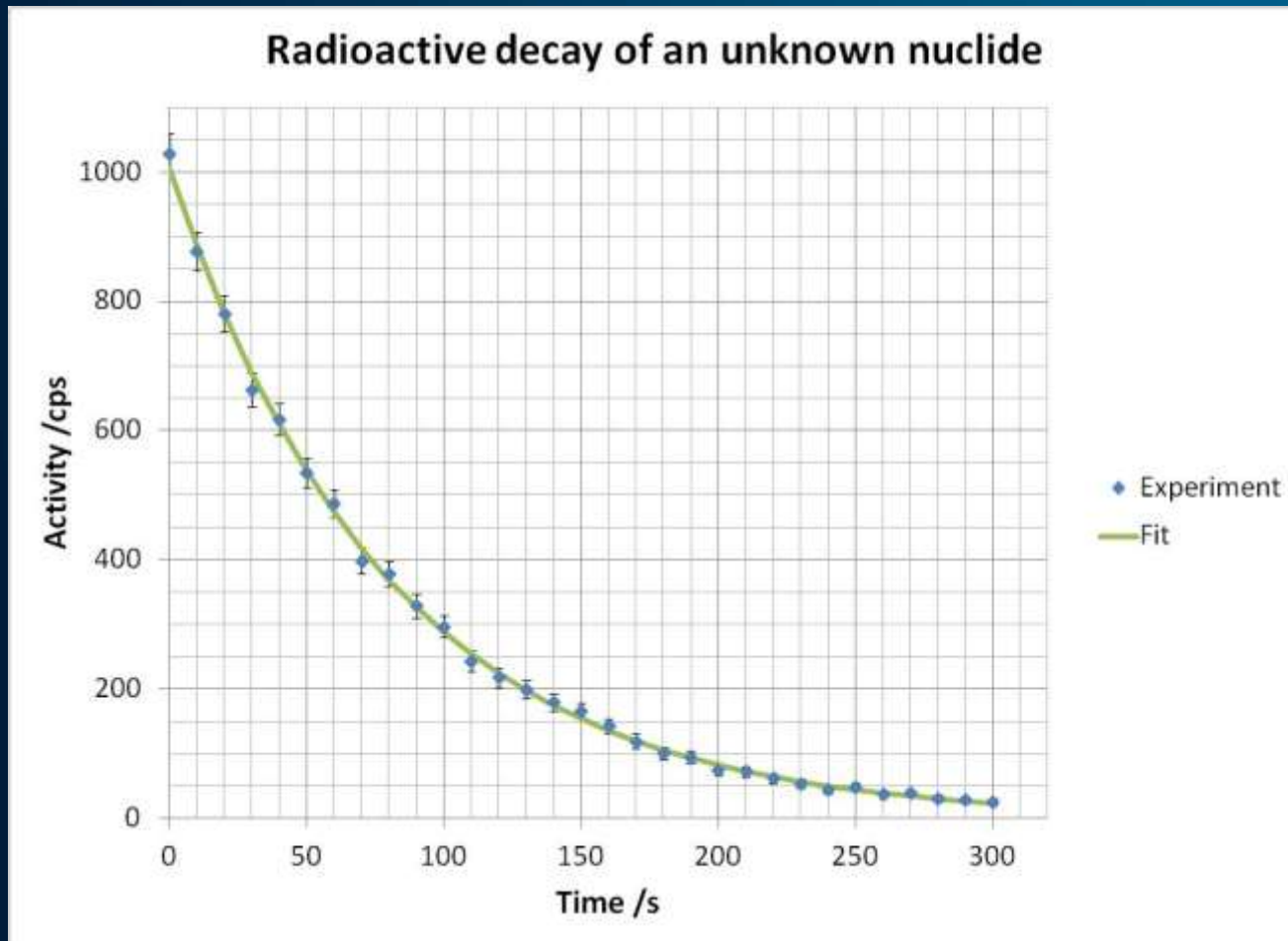
- Time distribution:
 - Nuclear Chem: 6 weeks
 - Politics: 6 weeks
 - Shared: 3 weeks

- Shared: Medical isotopes
(Chalk River crisis, future use of cyclotrons?)
and other app. of nuclear tech

Science Learning Outcomes

- classify radiation
- balance nuclear reactions
- describe basic models of nuclear structure
- perform calculations related to nuclear stability, energetics, and decay kinetics
- explain the design and function of a variety of detection equipment
- compare and contrast the purpose and design of a nuclear reactor and a nuclear weapon

Science Labs



Political Topics

- the history of nuclear energy in Canada
- nuclear energy in Canada and the World
- comparing nuclear reactor designs
- Canadian exports
- industry, government, and non-governmental organizations
- security; trade
- the cost of nuclear energy
- nuclear safety and nuclear disasters

Political Debates

- Is there a global nuclear revival?
- Is nuclear power the solution to climate change?
- Is nuclear terrorism a significant threat?
- Is nuclear waste a significant problem?
- Has the Fukushima Daiichi accident ended the global nuclear revival?

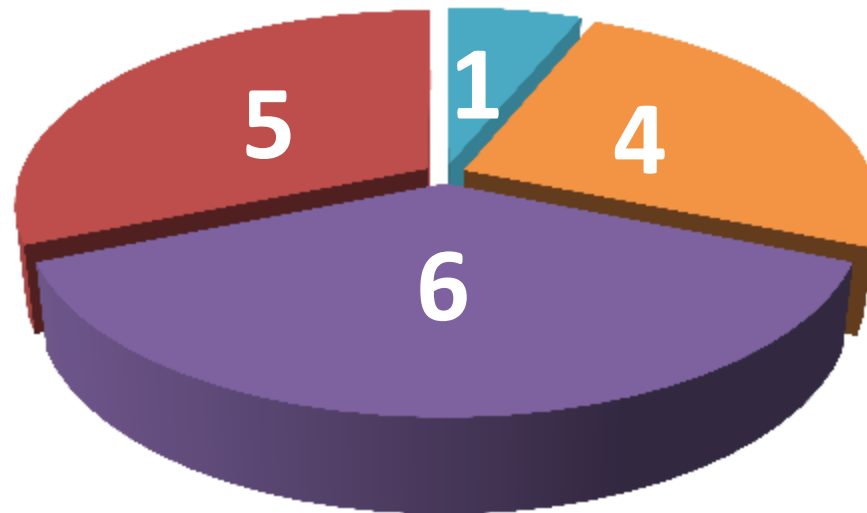


Student Profile

		2011	2012
# of Students Registered		6	31
# of Students Who Completed		5	29
BSC	General Science	1	12
	Health Science	0	13
	Biology	0	1
BBA	Management	1	1
	Marketing	1	0
BA	Psychology	0	2
Open Studies		2	0

Student Survey

I knew a lot about nuclear energy prior to enrolling in CHEM 3802.



Strongly Agree

Agree

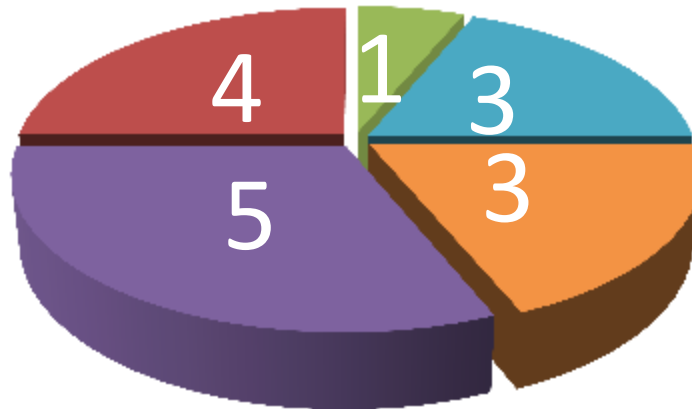
Neither Agree nor Disagree

Disagree

Strongly Disagree

Student Survey

The Fukushima-Daiichi nuclear accident made me more concerned about nuclear energy.



Strongly Agree

Agree

Neither Agree nor Disagree

Disagree

Strongly Disagree

Student Survey

- What was your opinion of nuclear energy prior to taking CHEM 3802?

"The Simpsons"

"Prior to this course I knew very little about nuclear energy. (I did not even know what Chernobyl was). I believed it was somewhat dangerous, but wasn't sure why. Now I am extremely interested in nuclear energy and plan on learning more about it! I also do not believe that it is dangerous any longer."

"Nuclear energy was a great resource that provided a lot of energy output. I didn't know about information such as wastes, or the substantial costs associated with building a reactor."

"Preferred nuclear energy over coal or oil and gas, though also preferred renewable energies in addition to nuclear energy."

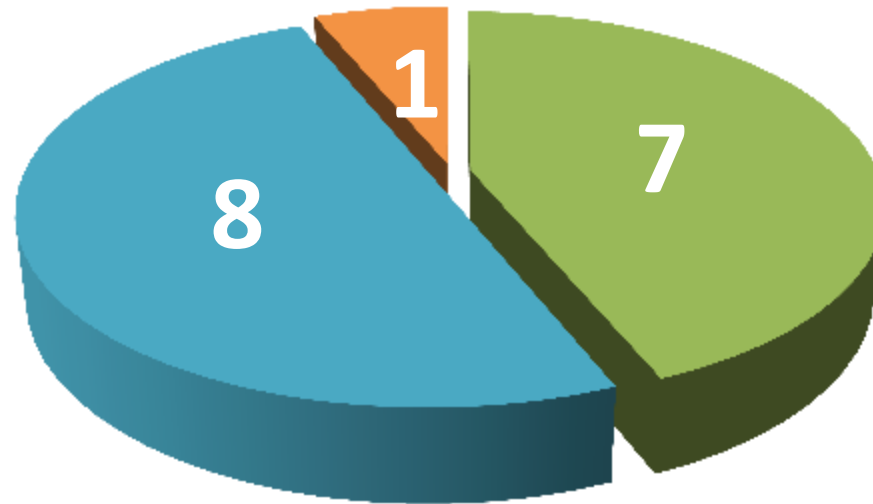
Student Survey

- Motivation for taking the course:

Reason	Number of Comments
Chemistry minor	7
General Education requirements	4
Interest in nuclear energy	11
Broaden my knowledge	1
My girlfriend was taking it	1

Student Survey

Nuclear energy is a safe and efficient form of electricity generation.



Strongly Agree

Agree

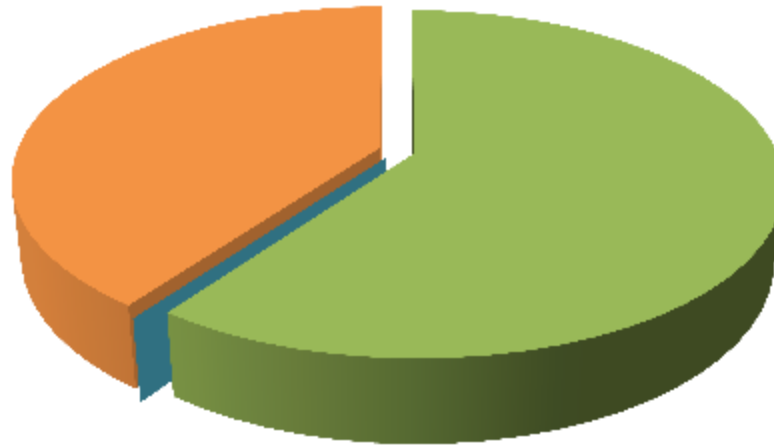
Neither Agree nor Disagree

Disagree

Strongly Disagree

Student Survey

I would like more emphasis in the course on...



- The science of nuclear energy
- The politics of nuclear energy
- Neither science nor politics. The balance of material in this course is appropriate.

Student Survey

"More integrated classes. Instead of just science or just politics, integrate the science into the political discussion, or vice versa."

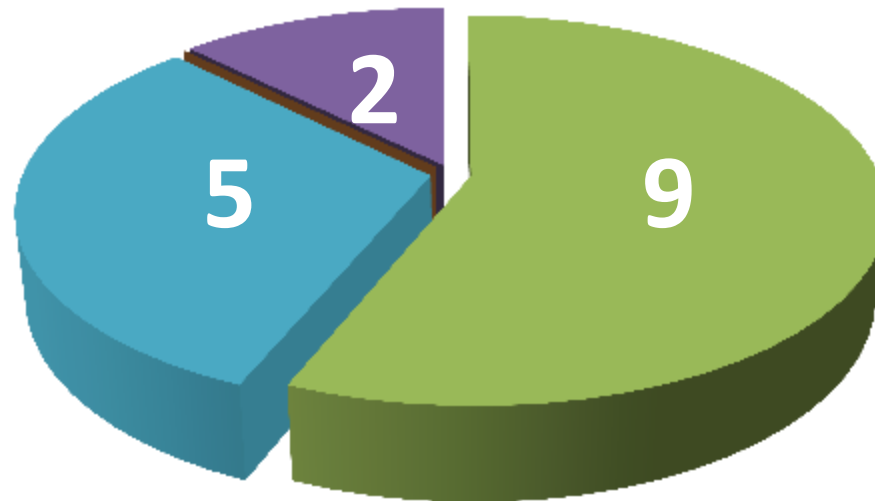
"2 hours is a long time to talk about policies and politics for a lot of science majors"

"Being a science major I didn't expect to take any form of PoliSci in university but this course really opened my eyes to how it affects my field of study."

"This class provides much more to than just science, it helps give what is needed for a scientist in the real world, an inside to the political factions of science."

Student Survey

I enjoyed having this course team-taught.



Strongly Agree

Agree

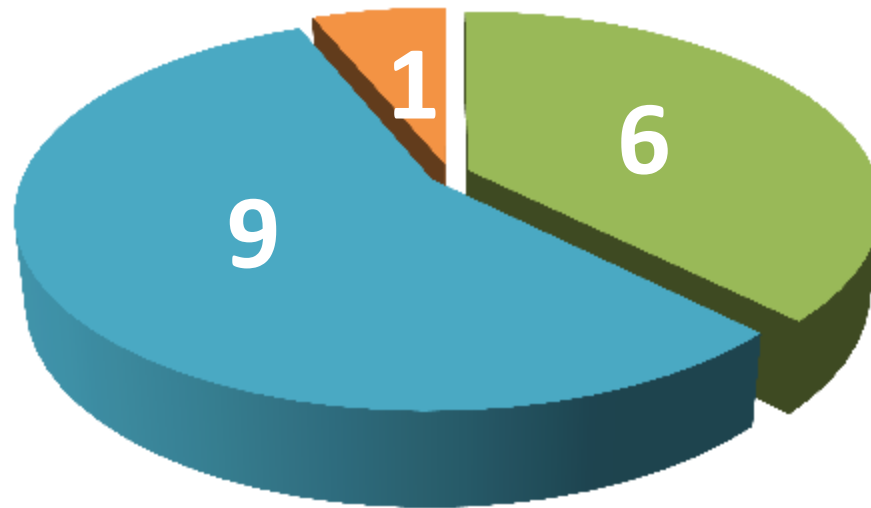
Neither Agree nor Disagree

Disagree

Strongly Disagree

Student Survey

I will recommend this course to my peers.



Strongly Agree

Agree

Neither Agree nor Disagree

Disagree

Strongly Disagree

Grade Breakdown

	2011	2012
A	3	5
B	1	19
C	0	5
D	1	0
F	0	0
W	1	2

Moving Forward

- Increase non-science enrolment (currently 5 of 30)
- Increase integration of topics?
- Science students' perception of politics

Suggestions for Developers

- Craft “wishlist” of topics then find commonality
- For common topics, decide if they will be taught from one approach, or if time should be doubled to teach from both points of view
- Fewer topics is better; time to fill in foundational gaps in either population

Suggestions for Developers

- Identify the importance and availability of learning materials
- Play to the strengths of the different disciplines
- Maximize group work, especially combining people from different discipline backgrounds
- Team-teach if possible