

Back to the Future

Re-Integrating STEM, Humanities, and Social Science
Education

Historical Context for STEM/Humanities Disciplinary Divide

While empirical studies of nature and scientific methods are thousands of years old, the designation of “science” as a distinct category of knowledge, and of “scientists” as a group is a modern phenomenon, emerging in the 19th century, replacing the broader category of “natural philosophy.” So, the roots of STEM, much as the roots of the social sciences (or “human sciences”) are in modes inquiry that we now classify as “humanistic.”

But that doesn't help us in an institutional and policy environment that sees these bodies of knowledge as espousing competing values, and worse, as competitors for educational and intellectual resources

These three recent articles shed some light on the public debate:

- [Steven Pinker \(experimental psychologist\) to Humanists: "Science is Not Your Enemy"](#)
- [Leon Weiseltier \(literary scholar\) to Pinker: Science Doesn't Have all the Answers](#)
- [Gary Gutting \(philosopher\) to Steven Pinker: Scientists More Responsible for the Science/Humanities Gap](#)

Most recently:

- Fareed Zakaria's argument against narrow focus on STEM in college education and a renewed emphasis on the Liberal Arts

In the modern era, we have scientists themselves to thank for surfacing the degree to which science is a subjective (and value laden), and therefore “humanist,” enterprise, though one with characteristic codes, methods, and ideals.

Werner Heisenberg (father of quantum physics):

“We have to remember that what we observe is not nature in itself but nature exposed to our method of questioning.”

Physics and Philosophy, 1952

If the truth be known, scientists are neither more nor less vain than other people. It is rather that their vanity is the more striking as it appears side by side with their well-known objectivity. The layman is scandalized, but the scandal is not so much the fault of the scientist as it is the layman's canonization of scientists, which the latter never asked for. *Love in the Ruins*

Walker Percy, MD

SENCER starting assumption:

“Science” takes place in a social context. Scientists, social scientists and humanists occupy the same ontological universe, and are prey to the same lack of “objectivity.” Sometimes they are exploring the same problems, but they are asking different questions.(e.g. Science can provide knowledge of genetics, stem-cell research, or nano-technology, but can not guide the ethical, legal, and political decisions about how that knowledge will be used.) Conclusion: Science is best understood as one aspect of a complex system of inquiry and knowledge production.

SENCER: Science Education for New Civic
Engagements and Responsibilities
The SENCER Ideals

SENCER's Civic Mission

- We have found that the successful disciplinary collaborations or integrations evolved organically from a mutual interest in the *problem* and are not forced collaborations
- Because SENCER courses focus on *unsolved civic and social challenges* the more obvious disciplinary integration was frequently policy-oriented and linked to social science disciplines (sociology, political science, economics, psychology etc)

Examples of Social Science Integration

- Chemistry and Policy (Chemistry and Political science)
- Global Warming (Chemistry and Social Psychology)
- Addiction: Biology, Psychology, and Society

But not entirely.....

Ethics quickly emerged as a critical context for SENCER topics:

- Biomedical Issues of HIV/AIDS
- Human Genetics
- _Chemistry and Ethnicity
- Forensic Investigation: Seeking Justice Through Science
- Stem Cells and Social Justice

As SENCER participating faculty cast a wider disciplinary net, we noticed increased attention in their courses to cultural and historical factors mediating the application of scientific knowledge to a problem

- Pregnancy Outcomes (gender studies)
- The Chicken (literature and narrative)
- AIDS Research: Global Understanding and Engagement received the Josiah Charles Trent Memorial Foundation Award in Medical Ethics and Humanities at Duke University in 2006

Why Humanize STEM?

WHY NOT?

**Humanizing STEM wouldn't be that hard, or that new—
William James was advocating the humanization of science
and technology fields at Harvard well over 100 years ago**

“You can give humanistic value to almost anything by teaching it historically. Geology, economics, mechanics, are humanities when taught with reference to the successive achievements of the geniuses to which these sciences owe their being. Not taught thus, literature remains grammar, art a catalogue, history a list of dates, and natural science a sheet of formulas and weights and measures.”

William James, “The Social Value of the College Bred,” 1907)

Or should we “STEM-ify” the Humanities?

THERE ARE EXAMPLES OUT THERE:: Art and Mathematics

[Smith College](#)

[Indiana University](#)

OR

Montgomery College's

Global Humanities Institute's

Faculty Development efforts to connect Scientists and
Humanists around the issue of Food:

“STEAMED RICE”—THE INTERSECTION OF STEM
AND THE HUMANITIES THROUGH FOOD

PERHAPS the real issue,
especially for undergraduates
before they choose their
specializations, is:

How do we design a “meta-disciplinary” general
education curriculum that helps students
understand the both the *power and limits* of
disciplines, and how they relate to, complement,
and enhance each other?

“The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn and relearn.”

Alvin Toffler, 1968

One of the *best resources* on, and arguments for, the critical role of a multi-disciplinary LIBERAL EDUCATION in developing civic and economic leaders:

Higher Education in Developing Countries:
Peril and Promise

February 2000, Task Force on Higher Education and Society, The World Bank—
Especially Chapter 6, “The Importance of General Education”

HIGHLY RECOMMENDED!

THE SENCER “MODEL” ASSUMES THAT
ONE OF THE BEST AND MOST NATURAL
WAYS TO INTEGRATE DISCIPLINARY CONT
ENT IS “THROUGH” CAPTIOUS,
UNSOLVED CIVIC PROBLEMS

We could add that the pathbreakers of the next
generation (as they were in the past) will be those
who can solve problems by “thinking outside the
box” of disciplines

“It is no accident that bacteria were first understood by a canal engineer, that oxygen was isolated by a Unitarian minister, that the theory of infection was established by a chemist, the theory of heredity by a monastic school teacher, and the theory of evolution by a man who was unfitted to be a university instructor in either botany or zoology...”

C.D. Darlington, Conway Memorial Lecture on the Conflict of Society and Science, 1948
Quoted by John Dewey in Introduction to revised edition of [Reconstruction of Philosophy](#)

DO YOU HAVE A COURSE THAT
INTEGRATES HUMANITIES AND STEM
CONTENT BY TEACHING “THROUGH” A
COMPLEX, UNSOLVED, CIVIC PROBLEM?

CONSIDER SUBMITTING IT AS A SENCER
MODEL!

[SUBMISSION INFO](#)