

Computer Science: An Emerging Liberal Art?

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The Liberal Arts

- What one should know other than a trade
- Emphasis: *keys* over *encyclopedism*
- Traditional division into *trivium* and *quadrivium*; what does this really mean?
 - Linguistic vs. mathematical?
 - Lower vs. upper?
 - Just part of the numerology of 3/7/12?

Trivium vs. Quadrivium (mine)

- *Trivium*: Foundational skills needed to function in learned society
 - e.g.: acquire, assess, disseminate information
- *Quadrivium*: A shared set of transcendent paradigms
 - e.g.: continuity and change in history, prediction and test in science

Information Technology vs. Computer Science

- IT: tools for acquiring, processing, and disseminating information
- CS: the study of information processes
“Computer science studies processes that manipulate symbolic information, the procedures by which those processes are carried out, the means by which the processes and procedures are designed, and related phenomena, such as the social impact of information processing and the use of information processing as a model for cognition.”
Computer Science Advising Guide, GAC

An Ambitious Goal Regarding IT

“Fluency with information technology (abbreviated as FITness) goes beyond traditional notions of computer literacy. ... [L]iteracy about information technology might call for a minimal level of familiarity with technological tools like word processors, e-mail, and Web browsers. By contrast, FITness requires that persons understand information technology broadly enough to be able to apply it productively at work and in their everyday lives, to recognize when information technology would assist or impede the achievement of a goal, and to continually adapt to the changes in and advancement of information technology.”

Being Fluent with Information Technology (1999), p. 15
Computer Science and Telecommunications Board

IT and CS's Places in the Liberal Arts

- IT, even in the ambitious sense of FITness, is *trivial*
 - not that it will be easy, or is unimportant
 - but it is foundational, like rhetoric
- CS, on the other hand, may join the *quadrivium*
 - this is what I want to examine

Two Big Ideas from CS

- Procedural epistemology
 - formalizing “how to” knowledge as general procedures for carrying out processes
 - viewing the world as processes that consume inputs, transform them according to a general procedure, and produce outputs
- Abstraction
 - e.g.: a “writing medium” is something you can write on and read from; not: paper, slate, ...

Procedural Epistemology Has Influenced Our Culture

- “Let’s get more input first.”
- “He can read just fine, but something is wrong with how he processes what he reads.”

So What?

- Important cultural paradigms often find their way into popular culture:
 - “He loves his mother.”
 - “Let’s try the experiment.”
- That doesn’t mean everyone understands *Oedipus* or science without studying it.

“Abstraction”

- Used in essentially the same sense in math
- Used in related senses elsewhere
- Has acquired new prominence through computer science, particularly by providing technologically significant leverage through focussing on interfaces and properties

The Practicality of Abstraction

- You can install *drivers* into your operating system or *plug-ins* into your web browser.
- What is a *driver* or a *plug-in*?
 - Either is a bunch of computer instructions, but so are lots of other things.
 - What makes it a *driver* or *plug-in* is that it provides a standard interface the OS expects from all drivers or the browser expects from all plug-ins.

Abstraction is on the Rise Outside Computer Science Too

- This probably isn't a coincidence; historically, concepts that become prominent in science or technology get taken up in broader society as well.
- Examples of non-CS abstraction:
 - outsourcing
 - telecommuting
 - school accountability

So What?

- You can't understand what it means for social change to be seen as “Darwinian” without studying biology.
- Similarly, you can't understand today's increasing treatment of people and organizations as black boxes without studying computer science.

But People *Shouldn't* Be Thought of as “Plug-Ins”!

- So is it wrong to teach black-box thinking?
- Many of the most vocal skeptics of social Darwinism are well educated about biology.
- A thorough understanding of a paradigm on its own terms is a good starting point for developing a critical understanding of its limitations as a model.

IT, CS and Trivium, Quadrivium

- There is no question that IT has changed how we acquire and evaluate information, how we express ourselves and persuade others. IT has clearly joined the trivium.
- CS is shaping how we think about the world, including how we think about one another; it provides an important paradigm that may be joining the quadrivium.