The Big 4 Methods in the Cognitive and Information Sciences

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Symsys 130
April 3, 2013
<table>
<thead>
<tr>
<th>Method type</th>
<th>Courses</th>
<th>Goals</th>
<th>Markers</th>
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</thead>
<tbody>
<tr>
<td>philosophical (analytical)</td>
<td>Intro Phil, Phil 80, Phil 160s and 180s</td>
<td>Define concepts, refine understanding, persuade, question conventional thinking, “quicken the sense of the queer”, “say things that are true but annoying”</td>
<td>claims, arguments; evidence based on introspection or common knowledge</td>
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<tr>
<td>formal (axiomatic)</td>
<td>Phil 150, 151, CS 154, Stat 116</td>
<td>Represent propositions and arguments rigorously enough so that no rational person could disagree that the conclusion follows from the premises; prove consistency, independence, soundness, completeness</td>
<td>definitions, axioms, theorems, proofs; mathematical and logical symbols</td>
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<tr>
<td>computational</td>
<td>CS 106, 107, 124, 220s</td>
<td>Automate the derivation of output data from input data; process information; simulate a process; find efficient algorithms</td>
<td>program code, descriptions of procedures/algorithms and of data, analysis of algorithms and computational complexity analysis</td>
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<td>empirical</td>
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<tr>
<td>• experimental</td>
<td>Psych 45, 50</td>
<td>Test hypotheses or possibilities in a way that allows for causal inferences</td>
<td>random assignment into conditions</td>
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<tr>
<td>• observational</td>
<td>Ling 1, 140</td>
<td>Collect and classify data from naturally occurring phenomena in which no variables are under the researchers' control</td>
<td>analysis of data generated by a natural process</td>
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<tr>
<td>[[hybrid methods]]</td>
<td>Ling 120, CS 103, Psych 209, Symsys 100</td>
<td>Combine two or more methods in order to answer a question better than can be done with a single type of method</td>
<td>presence of markers from more than one of the above</td>
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Socrates and the boy.

Soc. Let us describe such a figure: Would you not say that this is the figure of eight feet?

Boy. Yes.

Soc. And are there not these four divisions in the figure, each of which is equal to the figure of four feet?

Boy. True.

Soc. And is not that four times four?

Boy. Certainly.

Soc. And four times is not double?

Boy. No, indeed.

Soc. But how much?

Boy. Four times as much.

Soc. Therefore the double line, boy, has given a space, not twice, but four times as much.

Boy. True.

Soc. Four times four are sixteen — are they not?

Boy. Yes.
Formal Analysis – Epistemic Logic

Hector J. Levesque, A Logic of Implicit and Explicit Belief, 1984
Computational Analysis – Completeness and Complexity

Empirical Analysis – Wason (1966)

WASON CARD SELECTION TASK
Each of these cards has a letter on one side and a number on the other. Which two cards should you turn over to allow you to decide if the following statement is true:
“If there is a D on one side, there is a 5 on the other”?

D  A  2  5
A More Transparent Version:
To enforce the “over 21” law, which patron needs to be checked at a bar?

Beer  Soda  25  17