Perspectives in Computer Science(DAVC24)

Scientific Research Method

scientific: Conforming with the principles or methods used in science.
[WordNet, 2003]

science: Accumulated and established knowledge, which has been systematized and formulated with reference to the discovery of general truths or the operation of general laws; knowledge classified and made available in work, life, or the search for truth; comprehensive, profound, or philosophical knowledge.
[Webster, v048]

Scientific Research Method

research: Systematic observation of phenomena for the purpose of learning new facts or testing the application of theories to known facts.
[Webster, v048]

method: A way of doing something, especially a systematic way; implies an orderly logical arrangement (usually in steps).
[WordNet, 2003]

Quantitative vs Qualitative

Quantitative research is empirical research where the data are in the form of numbers. Qualitative research is empirical research where the data are not in the form of numbers. [Punch, 1998]

'Qualitative' implies a direct concern with experience as it is 'lived' or 'felt' or 'undergone'. (In contrast, 'quantitative' research, often taken to be the opposite idea, is indirect and abstracts and treats experiences as similar, adding or multiplying them together, or 'quantifying' them.) [Sherman and Webb, 1988]

Deskwork vs Fieldwork

Fieldwork refers to the process of going out to collect research data. Examples: visiting an institution to interview members of staff, standing on a street corner administering questionnaires to passers-by, or sitting in on a meeting to observe what takes place. [Blaxter et al., 2001]

Deskwork consists of those research processes which do not necessitate going into the field. Examples: the administration, collection and analysis of postal surveys, the analysis of data collected by others, certain kinds of experiments or laboratory work, literature searches in the library and writing. [Blaxter et al., 2001]

Experimental vs Non-experimental

The experiment is a situation in which the independent variable (also known as the exposure, the intervention, the experimental or predictor variable) is carefully manipulated by the investigator under known, tightly defined and controlled conditions, or by natural occurrence. [Bowling, 1997]

Cultural Influences

- ► Engineering science
- ► Health science
- ► Human science
- ► Natural science
- ► Social science
- ► . . .

Common Research Process

Often includes the following steps:

1. *Wonder:*
   a question
2. *Hypothesis:*
   a plausible answer and resulting testable hypothetical propositions
3. *Testing:*
   data collection and analysis
4. *Conclusion:*
   hypothesis rejection or acceptance (provisionally)

Case Study

- Observation and description of e.g. an animal, a human, a physical phenomenon.
- Can be performed when experiments cannot (e.g. for practical or ethical reasons).
- Cause-and-effect conclusions cannot be drawn.
- May not be representative.

Experiment

- One variable is manipulated under highly controlled conditions to see if this causes changes in a second variable.
- Allows to observe cause-and-effect relationships.
- Not always practical and ethical.
- May not reflect what happens in a less controlled environment.

Survey

- No direct observation but data is collected via interviews or questionnaires.
- Especially useful when a phenomenon is difficult to observe directly and when large numbers of subjects are sampled.
- Intentional deception, poor memory, or misunderstandings of the questions can result in inaccuracies.
- Cause-and-effect conclusions cannot be drawn.

Correlation

- Establishment of the degree and direction of relationships between variables or measures of behaviour.
- The relationships can be determined without directly manipulating the variables.
- Correlation can be used for prediction.
- Cause-and-effect conclusions cannot be drawn.

Scientific Publications

- Journal article
- Conference article
- Reports
- Dissertations
- Books

Databases

1. Selection
2. Indexing
   Keywords, thesaurus terms et cetera.
3. Integration and distribution

Search Process

1. Preparation
2. Search
3. Results
4. Evaluation

Essay

- 4 to 5 pages, times new roman, 12pt, single rows.
- At least 5 references.
- Copy of abstract (or introduction) and conclusion as appendix (except for easily accessible webpages and books).
- The readers are scientifically educated

The checklists found on the following slides are based on [Barnet et al., 2005].

Essay Structure

- Does the praragraph say anything? Does it have substance?
- Is the opening paragraph interesting enough to attract and to hold a reader's attention?
- Does each intermediate paragraph evolve out of the previous paragraph and lead into the next paragraph?

Essay Argumentation

- Is the closing paragraph effective, or is it an unnecessary restatement of the obvious?
- Are the assumptions likely to be shared by your readers or are they reasonable argued?
- Does the paper make a point, or does it just accumulate other people's ideas?
- Are the facts verifiable? Is the evidence reliable?
- Are all of the substantial counterarguments recognized and effectively responded to?
- Does the report make use, where appropriate, of concrete examples?

Essay References

- Are the authorities really authorities on this matter? Are the sources reliable?
- Are all sources accurately attributed and all quotations adequately introduced with signal phrases?

Summary

- Consider carefully what you want to say
- Have an idea, structure, focus
- Use concepts appropriately

References

Barnet, S., Bellanca, P., and Stubbs, M. (2005).
A short guide to college writing.
Penguin academics. Pearson Education, New York, 2. edition.

Blaxter, L., Hughes, C., and Tight, M. (2001).
How to Research.
Open University Press, 2. edition.

Bowling, A. (1997).
Measuring health : a review of quality of life measurement scales.
Open University Press, Buckingham.

Punch, K. F. (1998).
Introduction to Social Research: Quantitative and Qualitative Approaches.
Sage.

Sherman, R. R. and Webb, R. B., editors (1988).
Qualitative research in education: focus and methods.
Falmer, London.

Webster (v.0.48).
The collaborative international dictionary of english : 1913 webster.

WordNet (2003).
Wordnet (r) 2.0.