Traces...that didn't work out right II: Institutional differences

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In summer 2004, an ITiCSE working group did a study [2] examining the code reading and tracing skills of novice programmers. The primary data collected were the results from multiple-choice tests at 12 institutions; additionally, they interviewed a subset of the subjects, and kept hard copies of the examinations and/or scrap paper used by the students to doodle while they took the test. A key result of this study was that annotation, particularly tracing, was effective–annotated questions were much more often correct than non-annotated ones. This is consistent with [4], that it helps to reason on paper while taking exams.

Another aspect of this study was classifying the questions (into 2 classes) and the annotations (into many classes). The results showed that different questions were more likely to be annotated, that the kinds of annotations varied with the question classes, and that independent of the kind of question, annotation seemed to be an effective strategy for nearly every institution[3].

Some questions raised, however, could not be addressed. While there were differences in the average scores and the frequency of annotation across institutions, it was not possible to determine whether these were due to systematic institutional differences, or due to differences in how the data were collected. While there were interview transcripts, the interview style varied a lot, making it difficult or impossible to extract comparative information. Other things that varied across institutions was the semester-level of students tested, the situation in which testing occurred (in class, out of class, or during interview), whether students were allowed scrap paper, and whether students took the exam on line or with paper tests.

The purpose of this follow-up study is to collect similar data to WG study, with protocols designed to produce data that can be compared across

institutions. Specifically, students taking test should be at the same level: in the course where they learn about loops, conditionals, and arrays; questions should be administered in-class as either a test or quiz (that counts toward final grade); annotations will be analyzed on a random sample of all exams; annotation classification and scoring should be independently verified. No interviews will be given or transcribed, as that really increases the complexity and level of effort. Getting IRB approval should be easy.

Research questions:

1. Does performance increase when annotation is done, as in ITiCSE study?
2. Are there systematic institutional differences in test performance, annotation frequency, or annotation "effectiveness."

The MCQs used in the ITiCSE study provide a good starting point, as we have a bunch of performance data and detailed analysis (in the traditional question-literature sense, such as [1]) for them. The original test (12 questions) took about 55 minutes to do, so a subset would probably work best as a quiz (or part of a test).

References

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