GANNON77
Gannon, J.D.; An Experimental Evaluation of Data Type Conventions; CACM 20, 8 (August 1977) pp. 584-595.

This paper describes an experiment conducted at the University of Maryland to compare the effects of statically typed and "typeless" languages on programming reliability. If the experiment indicated that a typed language was the better tool, then it was further hoped to determine whether power (the ability to use operations defined for each type rather than building these operations out of more primitive operations) or redundancy (the context of each appearance of an operand implies a type which can be checked against its declared type) was the major factor in a typed language's superiority.

The Experiment

The two languages chosen for the experiment were small and designed to be as close as possible in all features that did not affect data types.

Thirty-eight graduate and undergraduate students were chosen as subjects. They were divided into two groups and were given the same problem to program. One group programmed it first in ST (the statically typed language) while the other in NT (the typeless language). Then, each group had to program it in the other language.

Each time that a subject compiled his program, a copy was made of it. These copies were all then checked for errors.

Errors were categorized into primary and equivalent errors. For any given state of the program, if the same error occurred more than once, then the first occurence counted as primary, while the others counted as equivalent and did not weigh as much as the primary error. Also if an error remained uncorrected in a program for more than five runs, it was weighted more heavily.

Results

The results of the experiment indicated that while the use of a statically typed language did not really reduce the original number of errors committed, it detected them more quickly.

In total, both groups of subjects committed fewer and less severe errors using ST than NT. An interesting phenomenon observed, was that the subjects that were better students benefited less from using ST than the ones that were poorer students. The author put forth one possible explanation, that the better students were more disciplined programmers and thus could cope better with the lower level data representation in a language such as NT.

The experiment also indicated that it was the power of the statically typed language that aided the subjects more than the redundancy.

In conclusion, this interesting paper presents the results of an experiment to compare statically typed and typeless languages. Though the results may not be surprising, they offer empirical evidence instead of only individual observations. As the author writes:

> Language designers are continually proclaiming constructs "harmful" and proposing alternative features. We are anxious to perform experiments on some of these features to determine if the alternative features achieve their goals.