

One Possible Frame for Thinking about Experiential Learning

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Summary

I argue that teaching statistical thinking is harder than teaching mathematics, that experimental design is particularly well suited to teaching statistical thinking and that in teaching statistics, variation is good. We need a mix of archival data, simulations and activities, of varying degrees of complexity. Within this context, I applaud the important contributions to our profession represented by Darius *et al.* (2007), and Nolan & Temple Lang (2007), the first for showing us how to make simulation-based learning simultaneously more flexible and more realistic than ever before, and the second for showing us a path-breaking technology that can make archival data the basis for active learning at an impressively high level of sophistication, embedding statistical thinking within real scientific and practical investigations.

Key words: Education; experimental design; experiential learning; transfer; abstraction; simulation; activities.

1 Introduction

The economist Paul Krugman (1994, preface) recounts a parable of karma and reincarnation in economics: the careful, rigorous, intellectually virtuous economist is rewarded in his next life by reincarnation as a physicist; the careless, loose-thinking, intellectually slovenly economist is punished by reincarnation as a . . . (gasp!) sociologist.

Plato would not have approved of this parable. In the curriculum he prescribed for philosopher kings, Plato had candidates start with a decade (age 20–30 years) devoted to the study of mathematics, a subject that would outrank even physics in Krugman's parable, but which Plato regarded as the *easiest* subject, good mainly for preparing young minds for the harder challenge of subjects like sociology and political science, subjects better reserved for the mature intellect.

As statisticians, we should resist physics envy and embrace Plato. Our subject, because it deals with real problems, is harder in Plato's sense than mathematics, albeit perhaps easier than sociology. In particular, those of us who teach statistics can recognize the truth of Plato's thinking. Teaching statistics as mathematics is comparatively easy, but teaching true statistical thinking is hard. It is in this context that I applaud the authors of the two papers—Paul Darius, Kenneth Portier and Eddie Schrevens (from now on DPS) and Deborah Nolan and Duncan Temple Lang (NL)—for addressing head-on the challenge of how we can help our students to grapple with the things that make statistics much harder than mere recipes and theorems. In what follows I group my comments under seven headings: After a first section that presents two general goals for learning in statistics courses, I argue in a short section that teaching design of experiments is