Learning Two Classification Schemes Over a Single Domain

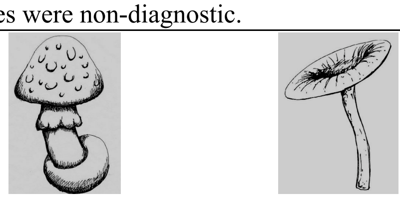
Kenneth J. Kurtz (kkurtz@binghamton.edu)
Olga Boukrina (oboukri1@binghamton.edu)
Department of Psychology, Binghamton University
Binghamton, NY 13902-6000

Introduction

Despite the existence of taxonomic hierarchies for natural categories, multiple cross-cutting category assignments are used in at least some domains (Ross & Murphy, 1999). The literature on sequential learning of different ways to classify the same items shows evidence of interference effects on the acquisition of a second scheme (Estes, 1994) and a backward influence on knowledge about the first scheme (Chin-Parker, 2004). We investigate the ease and transfer of category learning *after* or *while* learning another scheme.

Experimental Results

We evaluated the acquisition of two category schemes either serially or in parallel using unidimensional category structures and individuated exemplars. A set of naturalistic mushroom drawings were organized into two orthogonal binary classification schemes (Name and Function) based on variation of four binary features: cap shape (convex vs concave), presence of bulb, texture of cap (striated vs speckled), and presence of skirt. Cap shape determined the Name (Ardalia or Menedia); items with a bulb Enrich the soil and those without a bulb Deplete it. The texture and skirt features were non-diagnostic.



Ardalia / Enriches Menedia / Depletes

Figure 1: Sample Training Items.

Participants were randomly assigned to one of three learning groups: Serial, Parallel, or Single. For the Single group, learning trials consisted of choosing a category response on the Function scheme for randomly ordered instances with self-paced corrective feedback. Ss received six blocks of 16 training trials (96 total). Ss were then tested on classification (no feedback) of the original training items intermixed with four near- and four far-transfer items.

The Serial condition followed the same procedure except that Ss first completed 96 Name trials before the 96 Function trials. At test, Ss classified each item first according to Name and then by Function without feedback. In the Parallel group, Ss made category responses on both schemes within a single learning trial (Name was tested first) for a total of 96 trials and 192 responses. Corrective feedback was given on both schemes only after both responses were collected. The test phase procedure was the same as in the Serial condition.

A one-way ANOVA on accuracy of Function classification during learning showed a main effect of condition, $F(2,160) = 4.818$, $p < .01$.Pairwise tests showed reliably better learning for Serial (M=.88, SE=.024) than Single (M=.78, SE=.024). A significant interaction was also found between condition and learning block: Parallel learners (M=.81, SE=.025) started out like Single learners, but improved faster. At test, Parallel and Serial were both better than Single learners at classification of novel items.

We draw three conclusions from these data: 1) it was easier to learn a categorization scheme after having learned another orthogonal scheme than it was to learn from scratch; 2) category knowledge was more robust and extensible to new cases after learning two category schemes than one; and 3) the Serial and Parallel versions of multiple scheme learning produced similar results. There is one caveat to these findings: training two schemes requires twice as many classification trials. Further study is required to determine whether learning a second scheme is facilitative above and beyond the additional exposure. Either way, the present results offer a major surprise: learning to categorize a novel domain according to two orthogonal schemes does not inhibit category formation—it actually helps!

In a second study, we varied the degree of parallelism in learning two category schemes by manipulating the rate of switching between learning trials in one categorization scheme versus the other. We found that the largest scheme-consistent blocks (sixteen trials) showed better learning and transfer than smaller blocks (one or four trials). Therefore, learning two category schemes is better accomplished with massed than spaced practice.

Acknowledgments

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