

UC Merced

Proceedings of the Annual Meeting of the Cognitive Science Society

Title

Domains, Knowledge, and Constraints on Classification

Permalink

<https://escholarship.org/uc/item/9nx9j5ph>

Journal

Proceedings of the Annual Meeting of the Cognitive Science Society, 22(22)

Authors

Wattenmaker, William D.

Filak, Kathleen A.

Mendoza, Josephine A.

Publication Date

2000

Peer reviewed

Domains, Knowledge, and Constraints on Classification

William D. Wattenmaker (wwattenmaker@njcu.edu)

Department of Psychology; New Jersey City University
2039 Kennedy Boulevard; Jersey City, NJ 07305

Kathleen A. Filak (kfilak@njcu.edu)

Department of Psychology; New Jersey City University
2039 Kennedy Boulevard; Jersey City, NJ 07305

Josephine A. Mendoza (jmendoz2@njcu.edu)

Department of Psychology; New Jersey City University
2039 Kennedy Boulevard; Jersey City, NJ 07305

This research examined the domain-generalizability of learning and processing characteristics. Wattenmaker (1995) investigated the importance of linear separability as a constraint on categorization in object and social domains. Linear separability is a principle that has been investigated as a constraint on information integration in a number of different domains including connectionist modeling and categorization (e.g., Waldmann, Holyoak, & Fratianne, 1995). In relation to categorization, linearly separable categories are categories that can be partitioned on the basis of a weighted, additive combination of component information. Several different concepts from object and social domains were used in the Wattenmaker (1995) experiments, and in all cases linearly separable structures were easier to learn when they were represented by social descriptions (e.g., trait or behavioral features) than when they were represented by object descriptions (e.g., features of animals or human artifacts).

These results were interpreted as indicating that there are fundamental differences in the structure of domains and these differences lead to different types of background knowledge being associated with different domains. If the structure of knowledge varies with domain, then it will be difficult to formulate domain general constraints in terms of abstract structural properties such as linear separability.

In the present research, a number of implications of this knowledge-based approach to domain differences were investigated in five experiments, and the results provided several important extensions of previous research. The structural property of interest in the present experiments was Family Resemblance (FR), which is a property that is closely related to linear separability and that has been investigated extensively in categorization research. Compatibility with FR principles was examined by asking participants to divide descriptions into groups (e.g., see Medin, Wattenmaker, & Hampson, 1987).

One goal of the present research was to examine domain generalizability with a broader range of domains than was used in the Wattenmaker (1995) experiments. Thus, in addition to object and social domains, we included medical categories. In two experiments that used several different medical and social categories, many more FR categories were formed in the social domain than the medical domain. This result extends prior findings to a new domain and strengthens the

conclusion that the naturalness of structural properties will vary with domain

The results also revealed clear intra-domain differences. Previous research directly contrasted concepts from one domain with concepts from another domain. However, the knowledge view predicts that if types of concepts within a domain are associated with different knowledge, then differences should be observed within that domain. Indeed, we found clear differences within the social domain as FR structures were more compatible with social trait categories than with occupation or social event categories.

The results also supported the generality of the previous findings in that in all of the experiments FR constructions occurred much more frequently in the social than the object domain. Indeed more FR constructions occurred in the social domain even when social categories were contrasted with abstract categories such as “beautiful” and “freedom.”

In summary, the results support the finding that the structure of knowledge varies with domain and these differences in knowledge will make some strategies and processes more natural in some domains than others. This will make it difficult to specify domain general constraints in terms of abstract structural properties such as linear separability or family resemblance. Future research that directly compares different domains will allow us to converge on those aspects of structure and process that are domain-general.

References

- Medin, D. L., Wattenmaker, W. D., & Hampson, S. E. (1987). Family resemblance, conceptual cohesiveness, and category construction. *Cognitive Psychology*, 19, 242-279.
- Waldmann, M. R., Holyoak, K.J., & Fratianne, A. (1995). Causal models and the acquisition of category structure. *Journal of Experimental Psychology: General*, 124, 181-206.
- Wattenmaker, W. D. (1995). Linear separability and knowledge structures: Integrating information in object and social categorization. *Cognitive Psychology*, 28, 274-328.