

MPA 2010 Submission

Jee, B. D., Uttal, D. H., Spiegel, A., & Diamond, J. (2010, May). Understanding the microbiological world: People's beliefs and reasoning about viruses. Paper to be presented at Annual Meeting of the Midwestern Psychological Association. Chicago, IL.

Abstract: Viruses have a substantial impact on our health. The present study examined the structure and coherence of people's intuitive knowledge about viruses through in-depth clinical interviews. Analyses revealed topics that were well-understood, as well as inconsistencies and gaps in people's knowledge. Findings will contribute to the design of health-related instruction.

A. Title: Understanding the microbiological world: People's beliefs and reasoning about viruses

B. Area: Cognitive Psychology and Education

C. Problem or Major Purpose: Humans are exposed to viruses on a daily basis, and these viruses can have a substantial impact on our health. Viruses are invisible, and their effects, though often experienced, arise through mechanisms that may be poorly understood. The purpose of the present work is to examine what people believe about viruses, viral transmission, and vaccination. Understanding of the biological basis of infection is related to reasoning about behaviors that impact one's health (Au et al., 2008). In this work we explore not only the accuracy of people's beliefs, but the structure and coherence of their intuitive mental models, as well as the relation between people's mental models and their reasoning about health-related issues.

D. Procedure: We conducted detailed, semi-structured clinical interviews with a group of middle school students (n=12), teachers (n=18), and expert virologists (n=4). The sample was selected on the basis of their participation in a two-week instructional program about the use of new media to teach science, virology in particular. The interview questions included, (a) what is a virus?, (b) how do viruses infect living things?, (c) how do viruses spread between living things?, (d) how does the body respond to infection?, (e) how can viruses be prevented and treated?, and (f) how do vaccines work? The interview responses were coded for content and used to establish each participant's mental model (cf. Hmelo-Silver & Pfeffer, 2004). Both qualitative analyses (e.g., concept maps) and quantitative analyses were used to compare individuals within and between groups.

E. Results: Analyses revealed several distinct mental models across participants, varying in their content, coherence, and sophistication. Many of these mental models contained inconsistencies, e.g., beliefs about the appearance of a virus that were incompatible with descriptions of its mechanism of infection. In addition, several participants made recommendations about health-related behaviors, such as vaccination, but revealed shallow understanding of the mechanisms through which they operate. We will report additional findings about how students' and teachers' mental models are similar and different, and how they compare to expert models.

F. Conclusions and implications: People's understanding of viruses can have an important impact on their health (Au et al., 2008). The methods of the present study will help reveal the structure and content of people's understanding, and will contribute significantly to efforts designed to teach the public to not only perform but *understand* health-related practices.

G. References:

Au T. K. F., Chan, C. K. K., Chan, T. K., Cheung, M. W. L., Ho J. Y. S., & Ip, G. W. M. (2008).

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Hmelo-Silver, C. E., & Pfeffer, M. G. (2004). Comparing expert and novice understanding of a complex system from the perspective of structures, behaviors, and functions. *Cognitive Science*, 28, 27–138.