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Exploring How Agents-based Modeling and Culture Affects Children's Understanding of Complex Systems

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Introduction

It is known that the key to understanding complex systems is to decompose them into smaller, manageable chunks, and that the method of decomposition has an effect on the understanding of the system (Hmelo, Holton & Kolodner, 2000; Perkins, 1986; Wilensky & Resnick, 1999). However, these methods often lead to a focus on the structures or elements of a complex system over the relationships that actually allow these systems to emerge. In addition, learners seem to lack a natural affinity for system-type relationships (Tsuei, 2004; Wilensky & Resnick, 1999). To compensate, there is a need for methods that encourage an explicit attention to relationships in order to achieve a robust exploration and understanding of a complex system.

We seek to explore the potential of an *agents-based modeling* for understanding complex systems. We propose agents-based modeling as a framework to counter one's natural attention to the central/salient elements of a system by concentrating on the elements considered to be part of the field first so that all elements can be equally acknowledged as *agents* of the system, i.e. not only the salient ones. An expected outcome of this approach is the recognition of a greater number of system relationships in relation to the greater number of agents identified during modeling.

Further, the influence of culture on an agents-based modeling of a complex system is also considered in light of research demonstrating that people of East Asian and Western cultures attend to objects in the world differently (Nisbett, 2003). For example, Masuda and Nisbett (2001) found that East Asians reflect patterns of holistic thought and are more attentive to the context and relationships of objects than Westerners who reflect analytic patterns of thought and are inclined to decontextualize object structure from content and use formal logic to categorize them.

Method

Researchers will seek a large sample of preschool-age children between the ages of 4-5 years for this study. The children will be recruited from preschools in the United States and South Korea. Young children are the target of this research to determine when and how learners can be influenced in their systems thinking and cultural development.

Children will be asked to complete a conceptual styles task to determine their natural system of thought, learn a complex system in a traditional or agents-based model through a puzzle task, and then complete a posttest measure of their systems understanding.

Anticipated Results

First, it is anticipated that even at a preschool age, the East Asian children will demonstrate a holistic system of thought and Western children will demonstrate an analytic system of thought since child-rearing practices show cultural differences reflecting these systems of thought (Chao, 1995). While a holistic system of thought is expected to align with an agents-based modeling and an analytic system of thought with a traditional model, it is anticipated that the children in the agents-based modeling condition will have a deeper understanding of the complex system being studied, demonstrated by higher scores on the posttest measure, than children in the traditional model condition, regardless of culture. Further, qualitative differences in posttest descriptions of the systems are expected based on the child's natural system of thought and cultural background.

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