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Implicit cognitive development in cultural tools and children: lessons from Maya Mexico

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Abstract

Zinacantec Maya weaving tools and apprenticeship practices contain an implicit theory of cognitive development that corresponds to Piaget and Inhelder's explicit theory of cognitive development [The Child's Conception of Space, London, Routledge and Kegan Paul, 1956]. A set of preoperational and concrete operational spatial problems from the weaving domain provided empirical support for the ethnotheory of cognitive development implicit in Zinacantec weaving tools and their developmental sequencing. A structurally similar set of preoperational and concrete operational spatial problems were adapted from Piaget and Inhelder's Swiss research. Both sets of problems were presented to children aged 4–13 in Nabenchauk, a Zinacantec hamlet in Chiapas, Mexico, and in Los Angeles, CA, USA. While the sequence of operational development was the same across both domains and both cultures, Zinacantec children were more precocious with the weaving problems, whereas U.S. children were more precocious with the spatial problems adapted from Piaget and Inhelder. After a brief instructional procedure, children in both Nabenchauk and Los Angeles improved on the weaving problems only, within the maturational constraints typical of concrete operational development. Nonetheless, the brief learning experience could not reverse the advantage of long-term cultural familiarity with backstrap-loom weaving. Our conclusions are threefold: (1) An implicit ethnotheory of cognitive development, built into the sequencing of cultural tools, can be as developmentally valid as an explicit formal theory. (2) Culture-general Piagetian stages are harnessed in culture-specific situations. (3) Maturational readiness interacts with both long-term cultural experience and short-term learning experience to actualize concrete operations in

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a specific context. Cross-context generalization of Piagetian stages is far from automatic; it requires cultural learning.

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It is not unusual to think about cultural tools being designed for people of specific ages or with specific skills in mind. On a trip to most any toy store in a typical city in the United States, one can find toys with age-graded suggestions: “Suitable for ages 3–5” or “Not suitable for children under the age of 2.” Indeed, many toys are cultural tools that are designed for specific ages of children to develop specific skills, either cognitive or social. Educational toys, in particular, are cultural tools that are designed to train cognitive skills such as memory, reasoning, spelling, or analysis to children at specific ages or skill levels. Are these age designations arbitrary, or do they fit with parents’ implicit views of children, with children’s own motivations to play with the toys, or with explicit research on children’s abilities? This is the issue we set out to address in the present study, but in a different cultural context, that of Zinacantec Maya weaving.

We knew from prior ethnographic fieldwork that different cultural tools used in Zinacantec weaving seemed adapted to different levels of cognitive development, as described by [Piaget and Inhelder \(1956\)](#). In a sense, these weaving tools had implicit stages of cognitive development embedded in them. We also knew that parents helped children to use these different tools at ages that corresponded to the appropriate Piagetian stages; and, indeed, children sought out the different tools at the corresponding ages ([Greenfield, 2000a, 2000b](#)). Clearly, a model of Piagetian stage development was operating at the implicit level in children and parents, as well as in the tools. The major goal of the present empirical study was to examine whether this implicit theory of cognitive development corresponded to actual cognitive development of the children using the tools at the various ages. Would, for example, children make the predicted preoperational errors if they were too young to use a weaving tool that required concrete operational thought?

In the tradition of [Dasen, Mishra, and Niraula \(submitted for publication\)](#), we investigated the role of cultural learning, itself an implicit process, in the development of Piagetian stages of spatial representation. We investigated this by comparing the same children on two sets of concrete operational tasks. One set represented an important target of cultural learning in Zinacantán, weaving, the other less familiar, loops of string with spools of thread on them which were turned into figure-eights or “knots” (adapted from [Piaget’s 1956](#) knots task). We utilized a crossover design, comparing Zinacantec children with children in Los Angeles in which Maya backstrap-loom weaving is totally unfamiliar. The children’s cultural familiarity of the knots materials was, in a sense, equally familiar and unfamiliar; however, the task was a totally decontextualized one, without a real-world counterpart. The cultural familiarity of solving problems for their own sake, rather than

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