University of Connecticut
Department of Psychology
Developmental Mathematics Cognition Project
Principal Investigator: James A. Dixon

The major goal of the Developmental Mathematics Cognition Project (DMCP) is to understand the developing cognitive representations and processes that underlie children's abilities with mathematics. To this end, we conduct research on: a) the representations children use when solving real-world problems with mathematics, b) the processes involved in applying mathematics to problems, and c) how these representations and processes change developmentally. Our work draws on current research and theory from cognitive psychology, developmental psychology, cognitive science, educational psychology, and education.

DMCP hopes to contribute to the current initiative by providing up-to-date information and original research about the nature of children's mathematical cognition. Educators cannot be expected to effectively facilitate children's acquisition of mathematics, without an understanding of the acquisition process. Understanding complex processes within human cognition requires systematic scientific study. DCMP will assist in bringing the most recent science to bear on the problem of learning mathematics.

With support from NSF, DMCP recently completed a series of studies on the development of mapping processes in children's problem solving. Our results support a new model of children's mathematical problem solving that emphasizes the development of relational knowledge about mathematics. Children extract relational information from their everyday interactions with mathematics and use that information in problem solving. The model also suggests that, particularly in the early stages of learning about a new mathematical operation, children rely heavily on recalling instructional examples.

Recent work within DMCP has also shown that higher order relational information, including mathematical principles, can be discovered through repeated use of non-mathematical strategies. Children discover higher order relations by detecting the mathematical pattern within their own problem solving actions. Relations discovered in this way appear to be highly transferable to other domains.

With support from the University of Connecticut Research Foundation, DMCP will, over the next year, begin a study of children's early acquisition of arithmetic concepts. The study will examine how children's earliest relational representations of addition and subtraction are formed. The study will also address how the relations are transferred to multiplication and division when these operations are introduced. We anticipate that this work will provide important information about the genesis of the representation of mathematics.

We look forward to the important challenge of translating research on the cognitive basis of mathematical cognition into meaningful and productive curriculum.