Purpose of the Study

The purpose of this study was to explore a professional development model, *Seeing the World Differently*

Specific aims of the study were (a) to see whether, under this model, elementary-school teachers engage tasks in ways prototypical of science work, (b) to determine how they value their work during workshop components, © to measure whether the workshop affects their attitudes about teaching science, and (d) to gauge whether they consider their experiences as valuable science teaching professional development.

The main thesis behind the model is that drawing people who are inexperienced in science work toward using their native intelligence and experience on representational tasks in contexts and under imperatives that are prototypical of actual science work will bring them closer to understanding and valuing the way physicists approach building knowledge of the physical world and will help make the findings and conventions of physics meaningful.

The hypotheses behind the workshop model are that (a) much of the actual work undertaken within science cultures is cognitively approachable by most adults and children at some prototypical level; (b) such work can be intellectually and emotionally satisfying to adults and children, but may be culturally foreign; © given agency to resolve cognitive conflict in a familiar intersubjective milieu where cultural norms of science have differential power in meaningful situations, adults and children will choose to engage science work; and (d) engagement with science work that builds competence and capacity will lead the participants to incorporate some of the fundamental practices, values, and beliefs of science culture.

The general purposes of this study are to look at effects at stage 1 and stage 2 of the causal model and to gauge the social validity of the model. Specifically, it aims to (a) implement the model in a controlled way; (b) assess whether it elicits prototypical scientific modeling behaviors; © evaluate whether early childhood teachers value this kind of work as personally enjoyable, interesting, and useful; (d) measure the intervention's effect on teachers' beliefs about the task of getting children to learn science; and (e) evaluate whether early childhood teachers think the workshop as a whole was valid science professional development.

Research Questions

1. Do workshop participants engage in prototypical scientific modeling behaviors? 1.1. Do participants engage in arranging materials to create conditions for them to see and formulate questions about the physical phenomenon they are tasked to describe and explain? 1.2. Do participants invent measures for characteristics of the physical phenomenon they are tasked to describe and explain? 1.3. Do participants display

representational competencies in externalizing their thinking about the physical phenomenon they are tasked to describe and explain? 1.4. Do participants follow an epistemology of modeling while engaged in the prototypical scientific modeling tasks? 1.5. Do participants' modeling behaviors differ between the research phase and the publication phase of the core treatment?

2. Do workshop participants find subjective task value in the activities of the workshop? 2.1. Do participants find intrinsic task value in the activities of the workshop? 2.2. Do participants find utility task value in the activities of the workshop? 2.3. Do participants value the workshop phases (initial meeting, research phase, conference phase, publication phase, final meeting) differently?

3. Do workshop participants' expectancy for success in science tasks differ before and after the workshop? 3.1. Do participants self-efficacy beliefs toward teaching science differ before and after the workshop? 3.2. Do participants outcome-expectancy beliefs toward teaching science differ before and after the workshop?

4. Do workshop participants find social validity in the workshop as professional development? 4.1. Do participants believe the workshop focused on science content and pedagogy appropriate for elementary classrooms? 4.2. Do participants believe the workshop provided them with opportunities for active learning? 4.3. Do participants believe the workshop was coherently aligned with their curricula, standards, and the ways they will be evaluated professionally? 4.4. Do participants believe the workshop focused on science content and pedagogy that would be supported at their school or district level? 4.5. Would participants pursue opportunities for follow-up activities to assist in incorporating either the physics content or the teaching methods they learned into their classrooms?