

## ***Developing a Model of Science for Young Children: Connecting the Early Childhood and Science Education Communities***

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### **VEXATION**

It is no secret that most involved in Science Education (at the university level) do not have much professional experience in early childhood (preK through Grade 3) classrooms. Nearly all of us came to science education after undergraduate training within the sciences and were drawn into the teaching profession. Our love of science content, and subsequent training, usually meant we entered K-12 classrooms at the middle or high school level. My story certainly fits this scenario. I completed my undergraduate in Geology and decided to teach Earth Science at the high school level, so I took an extra year of coursework and became certified in Integrated Science grades 7-12. After teaching for three years in a high school, I returned to graduate school to complete a Masters degree in Science Education. I taught for another year at the middle school level before beginning my PhD program. It was in this program that I began to work with elementary teachers and children as part of a larger National Science Foundation project. It was this preparation that helped me land my current position, where I teach within the early and middle childhood programs. My main assignment is to prepare future teachers to teach science in grades Pre K-3 (ECED) and grades 4-9 (MCED).

I recount my story because I think that it is a common refrain for most of us working with elementary and early childhood programs. Honestly, I had never thought much about teaching younger children until my PhD program; furthermore, I have learned a considerable amount concerning the complexity of children's thinking over the last several years in my current position. It seems to me that science educators intuitively understand the importance of engaging young children in science. Certainly, I have yet to meet a science educator who believes that working with young children is not vitally important. However, it seems that our collective lack of experience impedes our ability to envision what we have to offer early childhood teachers and children. We could certainly play a considerable role in helping teachers of children better understand what scientists do. Please consider the overarching questions that frame this vexation and venture:

*Can we include young children in our conception of social capital? Consider the possibility of changing the relationship between children and the typical classroom from one of domination of their movement; talk and thought toward a freedom of intellectual engagement that better represents the nature of scientific understanding ... could this nurture a fruitful avenue to develop the social capital/infrastructure of the entire science community?*

My vexation grows from a heartfelt belief that we may be missing an extraordinary opportunity to develop the future of science through increased research with our youngest students. Certainly, there has been increasing attention on work with younger students, for example, the recent section in Science Education that focused solely on elementary science teacher education. However, there continues to be much more research being done with secondary and college level science students in most science education journals. Even within early childhood (ECED) literature there is a dearth of efforts related directly to working with our youngest scientists. However, research that does exist demonstrates that what is happening with children in ECED contexts is often aligned with meaningful inquiry-based approaches, but as children progress through the elementary grades student interest in science wanes, which has been attributed to "less investigative science practices" (351) employed by their classroom teachers (Watters & Diezeman, 2007). In a similar vein, Spector, Burkett, & Leard (2007) demonstrated that upper elementary teachers often resist notions of inquiry in their practice, claiming it gets in the way of the teaching what they "need" to do. Thus, the questions seem two-fold 1) How may we increase research efforts to better understand the meaningful and engaging pedagogy employed by ECED teachers in pre K-3 classrooms? 2) How might we develop avenues of collaboration between ECED teachers and science education researchers to develop a deeper understanding for what we have to offer one another in an effort to best serve children with impactful science experiences?

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### **VENTURE**

I often tell my undergraduate science teacher education students that most scientists are still able to see the world through the eyes of a child. They are still fascinated by things they do not know, see the beauty in everyday things, ask lots of questions and often do not accept an answer without some sort of investigation on their part. We value this tenacity in adults and feel that it is that skepticism that makes them good scientists. However, in children this behavior is often misconstrued as defiance and non-compliance particularly within the structure of schools. This is why our role as science researchers is most needed at this moment of increasing standardization and control in the classroom.

Thus, I wish to begin this venture by leaning on the social capital of the Crossroads group to think, engage, and ultimately help me conceptualize the possibilities for utilizing research in the early grades as a way to better understand how to inspire all learners in science. Science, with its special ability to facilitate children's critical thinking skills, has incredible potential for young learners. How might I convince the science education community of the importance of researching the work we are already doing with young children including: science demonstrations at local elementary schools, science night with a kindergartener classroom, and the whole myriad of work we are doing but may not consider research worthy. Secondly, many early childhood and elementary teachers may not fully grasp that much of what children innately do in investigating the world around them often wholly emulates the work of professional scientists. Therefore, one of the chief goals of the work within this venture is to develop a model of *science for young children* that will help teachers and scientists to better understand what they have to offer children within the realm of scientific understanding. This model would include appropriate tools; concepts and skills that are appropriate for young children and help both teachers and researchers better understand what science looks like with young children. This would help bring both researchers and teachers to the table and speak in ways that would help us communicate concerning how to use all of our resources and knowledge to best serve children in science.

I plan to engage in a series of studies that will investigate preschool children (ages 3-5) at the Kent State Child Development Center (CDC) and K-3 contexts in local schools. The CDC center has a well-established reputation for open inquiry around science topics related to the wetlands adjacent to the school. The K-3 project will work to contrast early elementary classrooms with pre-school contexts in an effort to explicate if/how science pedagogy changes as children progress through their early primary years. Interest in young children should be growing as states implement new grade band standards that separate birth to grade three from the upper elementary grades.

In addition, I am currently developing an edited series highlighting those researching science in the ECED context as a way to jumpstart the connections between the Early Childhood and Science communities. This work will include ECED teachers and science education researchers working and describing particular efforts with young children from Pre K to grade 3 classrooms. One of the final efforts of the edited series will entail a culminating piece that begins to frame a model of *science for young children*.

I would like to close this vexation and venture by bringing us back to the essential thoughts that framed this endeavor:

*In what ways may we maximize the potential of our social capital as a group of researchers who care about science and children? How might a model of science for young children help to develop the social infrastructure of the science community?*

In general, my goal of this piece is to impress upon readers for the importance of carrying out research with young children in science and that engaging children in more meaningful science experiences may determine the future health of the scientific community. We need young children to develop the future strength of scientific endeavors as much, if not more so, than they need our help in developing their scientific abilities. It is my contention that instilling scientific attitudes and habits of mind may be the easiest and most effective with children from birth to age eight. In this light, our community may be missing a golden opportunity to positively impact the future of the sciences, which we have all dedicated our careers to improve.