Curiosity Practice: A Powerful New Lever for Fostering Science Engagement

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Abstract: Curiosity is a perennial theme in science education policy documents and informal science education (ISE) mission statements. However, formal and informal science experiences often minimize curiosity by reinforcing an image of science as the territory of right and wrong. In this poster, we argue that this has negative implications for individual's participation in ISE. We then present *Curiosity Practices,* our approach to helping parents and children develop a sense of curiosity around natural phenomena.

Introduction

Imagine a parent driving the car when his child asks "Why do we put sand on the roads?" The parent might respond by stating the answer, suggesting they look it up, or calling an expert. All of these responses answer her question. But what if he treated the question as an opportunity to explore how the world works rather than explain? In this case, the parent might say "I notice they only put sand on the road after it snows," and the child might recall rough sand sticking to her skin at the beach. Here, parents and children would work together to check new ideas against what they know about other things and generate more questions.

This approach of exploring and making sense of the question is an example of *practicing curiosity* about science. Curiosity is something people *do*— "[it] is expressed through actions and attitudes that manifest themselves in wanting to know 'why'" (Hensley, 2004, p. 32). Many of us practice curiosity throughout our lives – from unpacking why a friend is angry with us to investigating the latest political turmoil. However, many of us do not experience curiosity around science related topics. Instead, we tend to think of science as a collection of final form facts to memorize, and this lack of curiosity can have negative implications for *whether* and *how* we participate in science, and science adjacent, activities. In this poster, we will present *Curiosity Practices,* our approach to helping parents and children develop a sense of curiosity around natural phenomena.

Grounding literature

Science outreach and education often (implicitly) assumes that improving individuals' knowledge of science content and the scientific process will improve their attitudes toward science, and how they participate in scientific activities. However, a growing body of evidence demonstrates this is not true: increased knowledge has only a modest impact on attitudes and actions (see review in National Academies, 2016). In this project, we build on an emerging literature from psychology to offer an alternative approach: *curiosity*—rather than knowledge—as a potentially powerful lever for changing *whether* and *how* individuals participate in ISEs (see Figure 1).

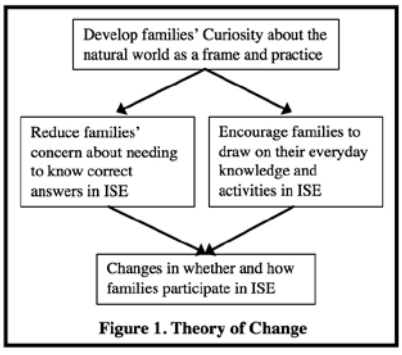

Figure 1. Theory of Change

Whether one participates

Unfortunately, informal science experiences disproportionally serve the students and families who already have access to good science education (Dawson, 2014). In fact, research suggests that parents are likely to avoid ISEs when they believe that they need to provide their children an answer (Hill & Tyson, 2009). Thus, the parents who are less comfortable with science ideas are less likely to create opportunities to explore science with their children, thereby passing their discomfort on. This study builds on the increasing body of evidence showing that a sense of

curiosity can reduce this sort of anxiety around the right answer (Bishop et al., 2004) by decreasing an individual's worry about judgement and defensiveness about their (lack of) understanding, and hence, potentially increase the likelihood that they will participate in science activities.

How one participates

How one participates in science, and science adjacent, activities and discussions is deeply shaped by our identities (Kahan, Jenkins-Smith, and Braman, 2011). Instead of evaluating and considering evidence, we tend to discount contradictory information and bolster our existing ideas (e.g., Mercier, 2011) and the ideas of the communities with which we identify. For example, one's beliefs about climate and energy are more closely linked to political affiliation than knowledge of the underlying science (Pew Research, 2016). In short, our identification with "sides" reduces our curiosity about other ideas, which perpetuates and strengthens the polarization in our communities. Yet there is intriguing evidence that being more curious about science increases openness to ideas that contradict one's own beliefs (Kahan et al., 2017).

Design innovation

Formal schools are notoriously bad at fostering a sense of curiosity and informal science experiences in settings such as museums have shown mixed results highly dependent on the design of the ISE experiences and the social context of the experience (NRC, 2009). Thus, our project explores the possibility of developing a "practice of curiosity" in children and families through *Curiosity Practices*.

The term *Curiosity Practice* encapsulates the theoretical and practical parts of our innovation. Theoretically, we use the term practice to describe an activity in which a community regularly participates that entails shared norms and goals (Berland, 2011). Here, the term represents a shared norm of elevating curiosity – rather than content – in the families that participate. Practically, we use the term practice to describe an activity we do to get better at something—like soccer practice.

In the practical sense, Curiosity Practices – our novel instructional design approach – are informal conversations with children and adults in which they explore everyday science topics with the goal of exploring something puzzling, rather than explaining it. In these conversations, children and adults are encouraged to draw on their everyday knowledge, make connections between different ideas, and seek causal explanations as they develop curiosity about how the world around them works.

Our poster

Our poster is designed to introduce *Curiosity Practices* to the ICLS community and receive feedback on both the design of the activity and the theories grounding it. We will do so with a poster that has two foci. On one side, we will define *curiosity*, and its theoretical potential for transforming *whether* our of *Curiosity Practices,* and the principles guiding our design.

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