Avenues for Engagement with Science: Knowledge, Nature, Problem Solving, and Passion
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Abstract

What do we know about how children become interested and engaged in science? Is there an early spark, a specific topic of interest, a school-based aptitude, a career goal, a passion for problem solving? This study looks at the life histories of 69 adults with science related careers, and explores some larger themes of how they began their life with science.

In some of our life histories we see an overarching orientation, or touchstone that anchors an approach to or interest in science. For some, this orientation relates to the passion of knowing about a specific topic, while for others we see a great love of problem solving, or nature, or tinkering.

We suggest that by coming to understand some of these common orientations to science we can broaden our ways of thinking about career paths. Ultimately we might begin to rethink how we design learning experiences to tap into and help support these early individual interests in science engagement.

Research Design & Methods

This analysis examines life-history interviews of 69 people from the ALR11. Interviews were transcribed and analysed using NVivo.

The ALR11 sample includes:
- 24 Professors (chemists, physicists, biologists, foresters, engineers, etc). All are Ph.D. holders.
- 24 Non-professors (engineers, chemists, foresters, crop scientists, etc). Some are Ph.D. holders.
- 21 Science Communicators (high school teachers, museum educators, extension agents, etc). Some are Ph.D. holders.

The analysis was looking for common themes in life histories: recurring avenues by which our participants have come to engage with science. Themes were determined through analysis of transcripts. To be included here, participants noted that the activity or context was influential in their choice of a science career.

Specific questions about influence and importance of different activities and contexts throughout the interview form the foundation of this work. participants indicated were key or extremely influential in helping them to wind up in a science career:

- We asked participants to provide a brief overview of how they got to be where they are.
- We asked about the earliest interest they had in science.
- Near the end of the interview we asked participants to reflect on their life story and to tell us what they felt had been the most influential moments and activities.

What We’ve Learned so Far

<table>
<thead>
<tr>
<th>ISLANDS OF EXPERTISE</th>
<th>Connexion to Nature</th>
<th>Problem Solving</th>
<th>Tinkering</th>
<th>Medicine</th>
</tr>
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<tbody>
<tr>
<td>Professors</td>
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<td>8% (2)</td>
<td>17% (4)</td>
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<td>Non-professors</td>
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<td>21% (5)</td>
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<tr>
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<td>7</td>
<td>1</td>
<td>2</td>
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<tr>
<td>Female</td>
<td>1</td>
<td>1</td>
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</tr>
<tr>
<td>Science communicators</td>
<td>29% (8)</td>
<td>38% (8)</td>
<td>19% (4)</td>
<td>24% (5)</td>
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<tr>
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<td>Female</td>
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</tbody>
</table>

Percent of total sample
- 29% (20) Connexion to Nature
- 17% (12) Problem Solving
- 19% (13) Tinkering
- 32% (22) Medicine

Note: 5 participants were coded as having more than one passion.

MATH AND PROBLEM SOLVING

Many in this group noted that their first love was really mathematics and logic. They were interested in calculating things and making spreadsheets—some documented baseball statistics, or to this day continue to calculate—things like counting the steps to work.

- “Math made sense. It was logical. Black and white.”
- “English had nothing to be solved.”
- “What I like about science is math. The truth of it.”
- “Logic puzzles were my earliest interest.”

The decision to move into sciences came later in high school, when exposed to science, and many talked about the fact that they like the math aspects in their science work. Others talk about the act of problem solving—which they transfer directly to their science work.

MEDICINE

These participants started out thinking that they wanted to be doctors. This was either via a strong interest in the domain (and/or supported by family), or as they thought they were smart enough to make into this career path. Some started as pre-med before changing into a different science.

- My parents were doctors. It was always around me.
- I had a book when I was little about how to be a doctor. That’s what I wanted to do.
- Medicine seemed like a respected career to be in.
- I went into college as pre-med, always thought I would do that, but then I liked the people who were studying chemistry better, so I switched.

Islands of Expertise

These participants talked about a passionate and enduring childhood interest characterized by a desire to study, observe, draw and learn lots of declarative facts about the subject.

- “I had 50 dino books by age 10 and I said in grade three that I wanted to be a palaeontologist.”
- “I was fascinated by birds. I watched them outside, I read books about them constantly. And I drew them.”
- “I was into dinosaurs first and then a long time into dungeons and dragons.”

In some cases these interests changed every couple of years up through the teenage years, but in some cases the interest endured into adulthood and their science careers. Books, TV, and Museums were often mentioned as sources of knowledge.

Connection to Nature

These participants talked about the importance of spending time in nature alone, with family, or with friends. They were widely interested in the wonders of the natural world and talk about their interest in observing the sights and sounds of their environment.

- “My family camped a lot. We really spent a lot of time outdoors. It was pivotal.”
- “For me it was always about nature. My first word was ‘worm.’”
- “Boy scouts really got me into nature. I just loved it, and ended up in forestry.”
- “My dad was a gardener. I was always into it too.”
- “Working with my grandfather on his farm was really important.”

Nature activities were often associated with family activities or organized programs, such as scouting.

Implications and Next Steps

Are these avenues the only ones? These are five common avenues seen in the data, there could be more. We haven’t yet analysed data from our group of amateur scientists, and they may show a different pattern of interest development and engagement than our career science types shown here.

Are these avenues mutually exclusive? No, in some cases we see several avenues represented in our interviews.

What’s not represented here? These were the most common patterns represented in the data. School was important in developing these early passions for many in our sample. Supplemental programs (particularly high school and college) will be crucial for many.

Parents are particularly important but family more generally (participants who did not distinguish which parent was influential) and mothers have not been analysed yet. Looking beyond the series of school-based course taking hurdles and understanding that there are a variety of possible avenues to science, will help us to think about different ways to tap into these initial avenues in design of informal learning experiences.