Public science literacy vs. science careers

The Science Learning Activation Lab's Pathways project

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What the heck is public engagement with science anyway?

**Personal**
- Dealing with a child’s autism
- Deciding whether to exercise
- Deciding how to live green
- *Reading science section of NYTimes / Die Zeit*

**Community**
- Participating in bird observation study
- Volunteering in local science fair

**Political**
- Voting for politicians who are pro NSF/DFG funding
- Campaigning against off-shore drilling

**Career**
- Government official deciding urban planning
- Manager deciding IT investments
Many productive engagements =>

• One skill set or many? Vs.

• One set of people or many? Vs.

• One pathway or many?
Re-conceptualizing Science Learning

Conundrum:
1. many children make early decisions for vs. against science
2. early decisions snowball to long-lasting outcomes
3. children are science learners (or not) in many contexts
4. long multi-context interventions too hard to arrange
5. effects of short interventions often don’t last long

=> Where and how to intervene???
The Science Learning Activation Lab
Conceptual Framework

Social Context

Early Learning Experiences

Activation

Later Learning Experiences, Gatekeepers, Friction, Lighthouses

Science-related Careers

Science Literacy

Age 8
Age 11
Age 14
Age 18
Adult
Defining Activation

*Science activation* is a state composed of dispositions, skills, and knowledge that enables success in proximal science learning experiences.

Proximal = next science learning context
(e.g., summer camp -> science class; biology class -> chemistry class)

Success =
1. make free choice
2. positive, meaning-making experience
3. learning goals met
Core ActLab Hypotheses

1. **Science activation is real.** Higher levels of an individual’s activation enable greater likelihood of success in proximal science learning experiences.

2. **Science activation is malleable.** Well-designed experiences can increase activation; poorly-designed experiences can deactivate.

3. **Science activation is predictive.** Activation by early adolescence is predictive of science related future pathways and distal outcomes.
Activation in Science

Skill? Knowledge? Prepared?

Will? Dispositions? Inspired?

- argumentation
- causal reasoning
- modeling
- questioning
- metacognition
- big ideas
- epistemological beliefs
- curiosity
- interest
- responsibility
- persistence
- identity
- autonomy
- achievement goals
- appreciate value

Contexts
Topics
Ways of Engaging
ActLab Pathways — Predictive of What?

Activation
Skill, knowledge, dispositions

Predicts

Scientific Literacy
(Engaged citizen, hobbyist, Science aware citizen)

Scientist/Engineer

Other STEM Careers
(teacher, journalist, technician)

Other Careers
ActLab Multi-cohort Longitudinal Study

(and 400 retrospective + secondary data analyses)
Public Engagement with Science

What’s the connection?
One outcome or many?

In the local ecosystem
Scientific Literacy
(Engaged citizen, hobbyist, Science aware citizen)
Scientist/Engineer
Other STEM Careers
Other Careers

Vs.

Out of the local ecosystem
Scientific Literacy
(Engaged citizen, hobbyist, Science aware citizen)
Scientist/Engineer
Other STEM Careers
Other Careers
One pathway?

Scientific Literacy
(Engaged citizen, hobbyist, Science aware citizen)

Scientist/Engineer

Other STEM Careers

Other Careers

Rich (and mediocre) formal and informal experiences
Or many pathways?

- Informal experiences
- Straight formal path
- Bumpy formal path

Scientific Literacy
(Engaged citizen, hobbyist, Science aware citizen)

Scientist/Engineer

Other STEM Careers

Other Careers
Many engagements
(personal, political, community, career) =>

One skill set or many?

One set of people or many?
  => who needs support?

One pathway or many?
  => where & when should support be given?