Scaling Up In Communities Through Informal Science Education Networks & Ecosystems

Kirsten Ellenbogen
@kellenbogen
• Why informal science education environments?

• Networks – when to partner and best use case

• Education Ecosystems – when to partner and best use case
LIFELONG AND LIFEWIDE LEARNING

- 9.25% Formal Learning Environments
- 18.5% Informal Learning Environments
- 7.7% Formal Learning
- 5.1% Informal Learning

0-5 K | GR 1-12 | UG GRAD | WORK | RETIREMENT

- Formal Learning Environments
- Informal Learning Environments
Most Americans rely on general news outlets for science news, but only a minority says these outlets get facts right

<table>
<thead>
<tr>
<th>% of U.S. adults who say ...</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>They regularly get their science news from each source type</td>
<td>54%</td>
</tr>
<tr>
<td>Each source type gets science facts right most of the time</td>
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</tbody>
</table>

**GENERAL NEWS SOURCES**

| News outlets that cover a range of topics | 28% |

**SPECIALTY SOURCES**

| Science and technology centers or museums | 12   | 54 |
| Documentaries or other science video programs | 45   | 52 |
| Science magazines in print or online | 25   | 47 |
| Government agencies | 10   | 29 |
| Science podcasts or radio programs | 12   | 28 |
| Advocacy organizations | 6    | 22 |
| Online discussion forums about science | 11   | 16 |

Note: “Most of the time” combines those who said “almost all” or “more than half” of the time. Respondents who gave other responses on each question or who did not give an answer are not shown. Other source types rated are not shown.

Source: Survey conducted May 30-June 12, 2017.

“Science News and Information Today”

PEW RESEARCH CENTER
Planning Early for Careers in Science

Robert H. Tai, * Christine Qiu Liu, Adam V. Maltese, Xitao Fan

Young adolescents who expected to have a career in science were more likely to graduate from college with a science degree, emphasizing the importance of early encouragement.

Concern about U.S. leadership in science has captured the national spotlight once again (1). The physical sciences and engineering are at particular risk, with declines in the number of earned doctorates in these fields among U.S. citizens and permanent residents in the past decade (2) (Figs. S1 to S3). Recommendations for improvement focus on education, particularly in improving the number of teachers and the quality of teacher training for primary and secondary schools (1). This is an attractive but expensive approach.

How important is it to encourage interest in science early in children's lives? How early in their lives do students decide to pursue a science-related career? We used nationally representative longitudinal data to investigate whether science-related career expectations of early adolescents predicted the concentrations of their baccalaureate degrees earned years later. Specifically, we asked whether eighth-grade students (approximately age 13) who reported that they expected to enter a science-related career by age 30 obtained baccalaureate degrees in science-related fields at higher rates than students who did not have this expectation. We analyzed students in the United States for years 1988 through 2000 and controlled for differences in academic achievement, academic characteristics, and students' and parents' demographics.

Survey and Analysis
We used the National Education Longitudinal Study of 1988 (NELS:88) for this study. Designed and conducted by the National Center for Educational Statistics (NCES), NELS:88 began in 1988 with a survey of 24,599 eighth graders. Researchers conducted additional surveys in 1990, 1992, 1994, and 2000. The overall sample size was 13,230 students.

MULTINOMIAL LOGISTIC REGRESSION ANALYSIS

<table>
<thead>
<tr>
<th>Independent variable</th>
<th>Coefficients of nested models</th>
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<tbody>
<tr>
<td></td>
<td>Baseline</td>
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<tr>
<td>Career expectations</td>
<td>Life sci.</td>
</tr>
<tr>
<td></td>
<td>Phys. sci.</td>
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<tr>
<td>Covariate groups</td>
<td>Student demographics</td>
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<td></td>
<td>Academic characteristics</td>
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<td>Parent background</td>
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Regression analysis results. P < 0.001 for all data shown; + indicates inclusion of covariates in the model; standard errors are shown in parentheses; n = 3359. Dependent variables: nonscience = 0, life science = 1, and physical science/engineering = 2. See supporting online material for more details.

Our analysis focuses on the independent variable derived from the NELS:88 survey question: "What kind of work do you expect to be doing when you are 30 years old?" Students were then given a list of employment options and required to select only one. We categorized the responses into two groups: science-related and nonscience career expectations, creating the Career Expectation independent variable (4).

We applied multinomial logistic regression, which handles categorical dependent variables with more than two outcomes. Our analysis included two outcome comparisons in earned baccalaureate degrees: (i) earning degrees in life sciences versus nonscience areas and (ii) earning degrees in physical sciences/engineering versus nonscience areas. We assessed the degree to which the independent variables could predict these two comparisons. In the NELS:88 sampling design, two analytical issues require special attention: (i) the effect of purposeful
✓ Time
✓ Trust
✓ Impact
(Caveat)

Networks – scale wide
Ecosystems – scale deep
LIFELONG AND LIFEWIDE LEARNING

9.25%

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5.1%

0-5 K GR 1-12 UG GRAD WORK RETIREMENT

FORMAL LEARNING ENVIRONMENTS

INFORMAL LEARNING ENVIRONMENTS
Networks

- National or international
- Values, Content, Audience, Urgency
- Boundary organizations
- Maximize (and measure) impact
- Hungry (but busy)
NISE Net

Science Festival Alliance

Citizen Science Association

Living Lab

Every Hour Counts
Healthy Network Test

1. Shared vision
2. Productive
3. Internal coherence
4. Two way mechanisms
5. Multiple ways to participate
6. Validity in the field
7. Codified governance

Source: Inverness Research, Characteristics of a Healthy Network
Participating STEM Learning Ecosystems
Making in NEO

- Adult Education and Certificate Programs
  - 2-year program / 4-year programs
  - Post-college programs
- Birth to Pre-K / Grades K-3
- Grades 4-8
  - Community-based programs for children and adults
- Grades 9-12
  - Summer Camps
  - After-school Activities
  - Music and Arts
  - Tours/Field Trips
  - Government Initiatives
  - Libraries
  - Community-based clubs
  - Schools
  - Museums
  - Community Engagement, Clubs, etc.
  - After School / Vacation
  - Competitions
  - Informal Education
  - Formal Education
  - Schools
  - Public Spaces
  - Summer Camps
  - Festivals and Fairs
  - After-school Programs
  - Competitions
  - Clubs
  - Internships and Volunteer Experiences
Kirsten Ellenbogen.
Great Lakes Science Center
kirsten.ellenbogen@glsc.org
@kellenbogen