RAIN

rural activation and innovation network

NSF DRL #1612555

Welcome! To R.A.I.N. in AZ

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About the Team

RAIN Leadership Partners

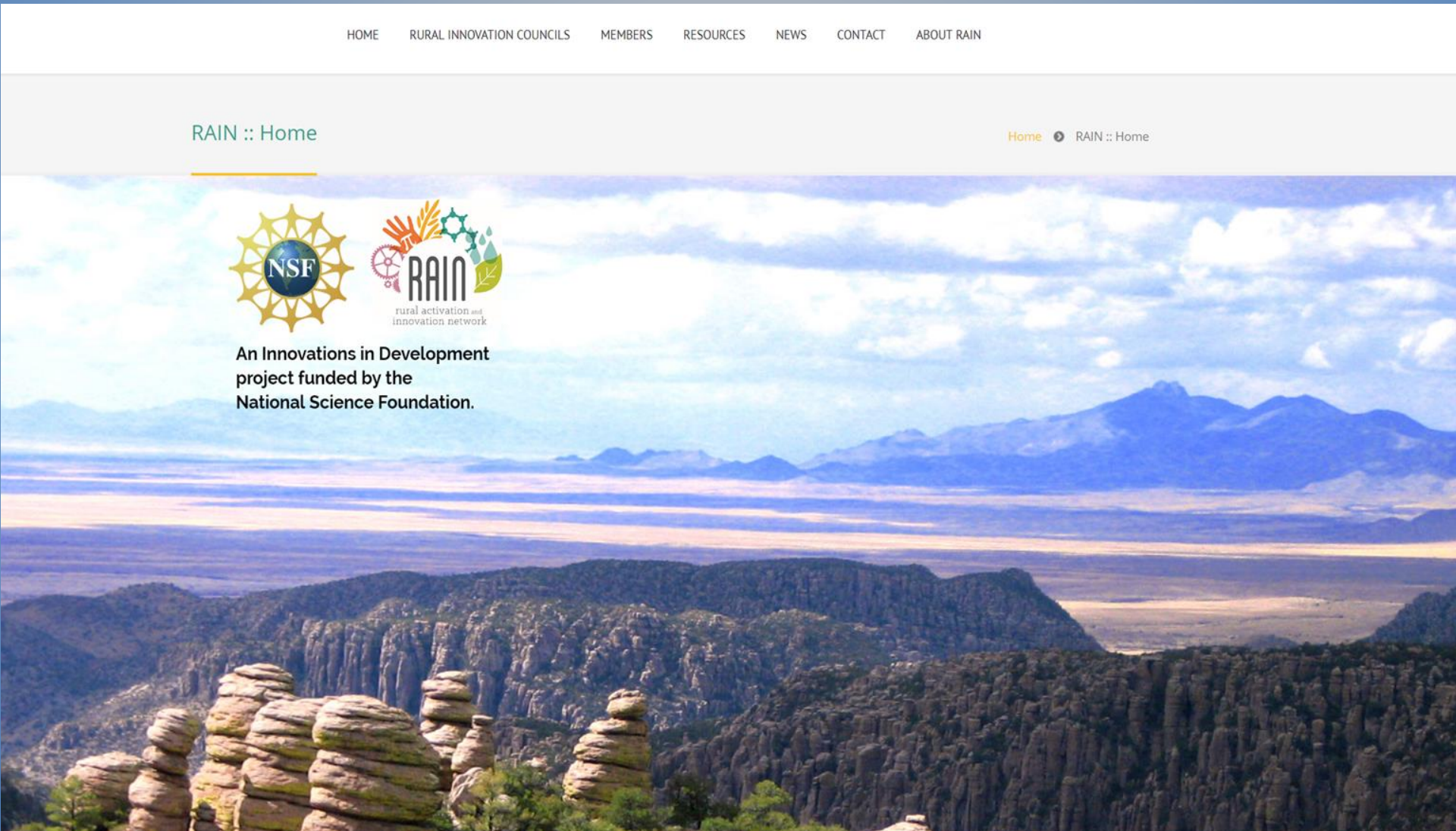
- Jeremy Babendure, Ph.D. – PI Arizona State University, Arizona Technology Council
- Kalman Mannis M.Ed D.D., Arizona Science Center
- Beth Nickel, M.Ed., Arizona Science Center
- Karen Peterman, Ph.D., Karen Peterman Consulting

Project Research Team

- COSI's Center for Research and Evaluation (CRE)
  - Gary Timko, Ph.D. – Co-PI
  - Dolly Hayde, M.A.
  - Justin Reeves Meyer, Ph.D.
  - Laura Weiss, M.A.
- Jill Stein, M.A. – Research Director (JKS Consulting)
- Eric C. Jones, Ph.D. – Affiliated Researcher, Network Analysis Lead (The University of Texas)

With additional contributions from Rebecca Nall, Martin Storksdieck, Ph.D. (Oregon State University), Andrew Vernon, Dania Wright, and the RAIN regional evaluation leads (Paulette LeBlanc, Dan Matchette, Lynn Winslow, and Tammy Gadeberg)

Rural Activation and Innovation Network Website



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RAIN
rural activation and innovation network

Rural Activation and Innovation Network development and design.

The proposal grew from an observed need for place based informal STEM learning opportunities in rural and remote communities, and a lack of understanding on how to build a culture of rural STEM Identity.

And…it took 5 years to get funded

RAIN
rural activation and innovation network

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Insight into the RAIN Grant

- Provided an opportunity to study, promote, and engage rural and remote communities.
- Developed a much needed database of best practices for reaching this population.
- Represents seminal and foundational work in the area of Rural Informal Science Education (ISE).

Deeper View into RAIN Ecosystems

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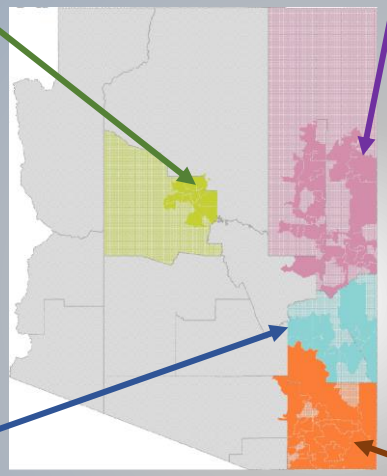
Verde Valley (VV)

Isolated river valley with four towns and one tribal nation.

Sq Mi: 748
Pop: 65,300

Audiences gathered at Yavapai College's Xplorology



Navapache (NA)

Remote mountain community with 4 cities, 4 towns, numerous unincorporated villages, and 1 tribal nation. 80% of the land is federal or state controlled.

Sq Mi: 10,000
Pop: 100,000

White Mountain Apache, Innovation Nation STEM Expo

Graham/Greenlee (GG)

Mining and agriculture community with 2 cities, 5 towns and 1 tribal nation.

Sq Mi: 6,489
Pop: 46,000

STEM Summer Camp - Eastern Arizona College

Cochise County (CC)

Blends agriculture, military, and natural resources with 1 city, 5 small towns, and several unincorporated villages. Shares southern border with Mexico.

Sq Mi: 6220
Pop: 127,000

Maker Lab at Studio 128 - Willcox

DRL #1612558

The following questions guided the research:

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- How do rural communities perceive, access, and engage in informal STEM learning?

- How, and to what extent, do community members identify themselves and their communities in relation to STEM?

- How do networks foster STEM related identity at personal & community levels?

cosi Center of Science and Industry
CENTER FOR RESEARCH & EVALUATION

RAIN

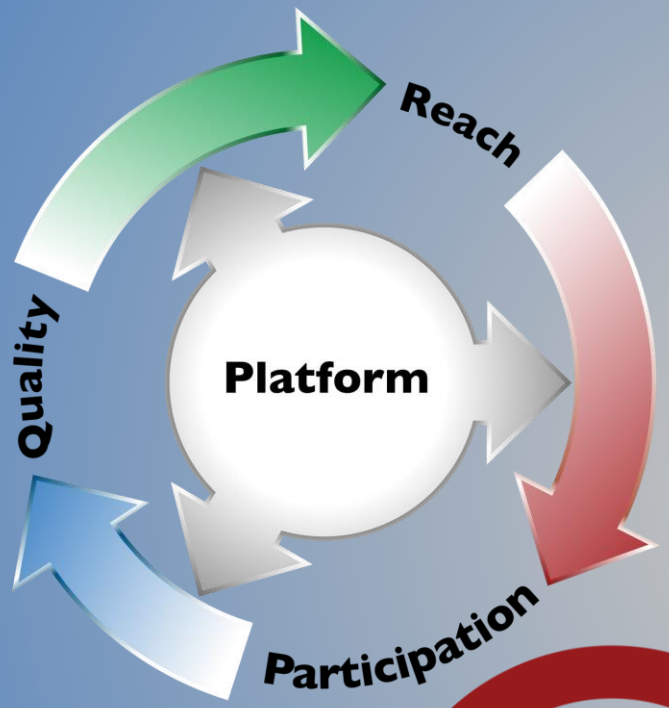
Local Agents

Rural Innovation Council (RIC)

- Encourage a change in local identity in relation to the value of STEM learning
- Guide an understanding of the value of STEM learning on the local economy

- Create a scope of work that engages community resources and expertise
- Build a research base on best practices to engage and empower communities to use STEM as the basis for change.

RICs Took Charge



In their first year (and reviewed annually) RICs developed a set of artifacts to help guide their efforts:

a. Asset Map
b. Needs Identification
c. Strategic Plan
    - Outreach Plan
    - Budget Plan
    - Media Plan

Rural Innovation Council Network Snapshots
Multi Generational Opportunities

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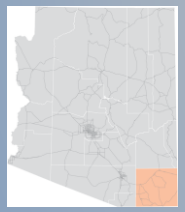
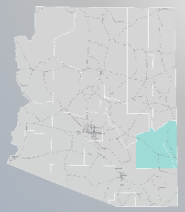
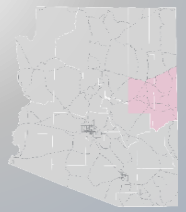
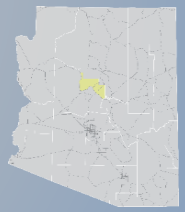
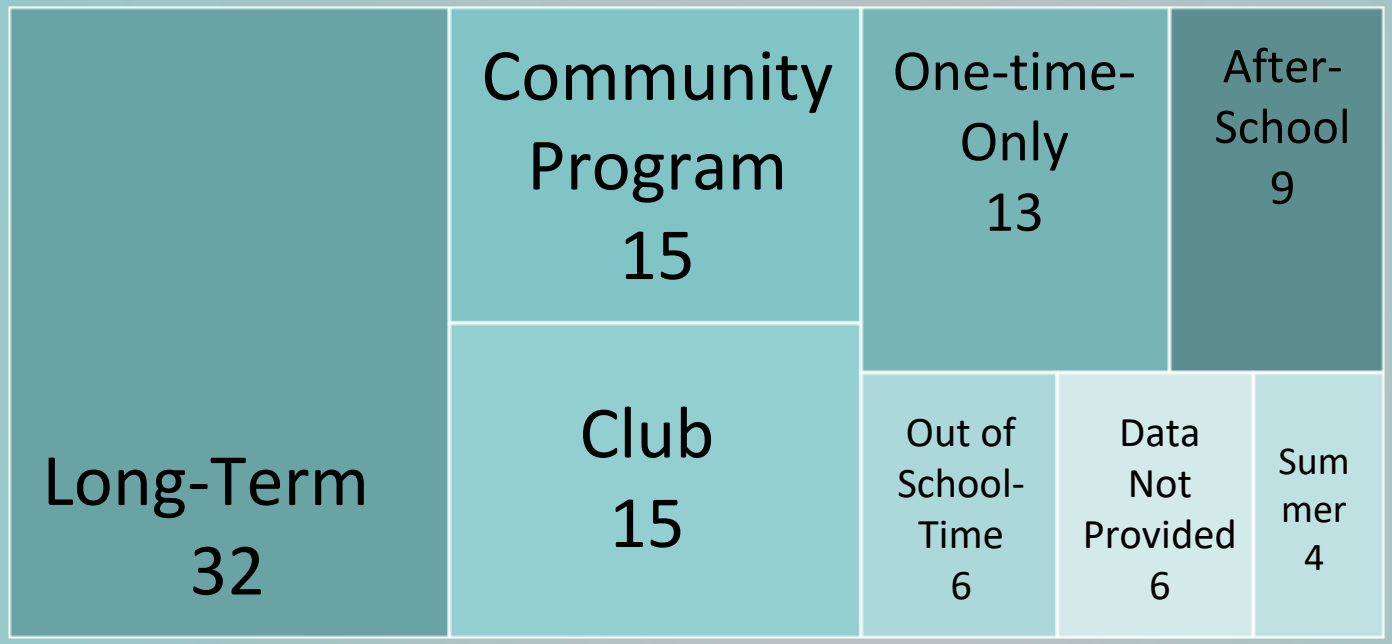
RAIN Research Findings

Research Data on slides 20-47 were developed, compiled and analyzed by Donnelley Hayde, Gary Timko, PhD, and associates from COSI's Center for Research and Evaluation along with Jill Stein from Jill Stein Consulting. External Evaluation was overseen by Karen Peterman, PhD of Karen Peterman PhD Consulting.

Outreach Program Type:
Across Regions



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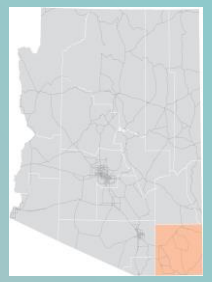
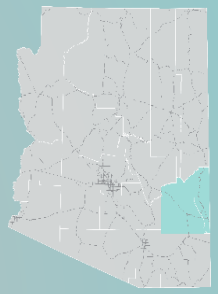
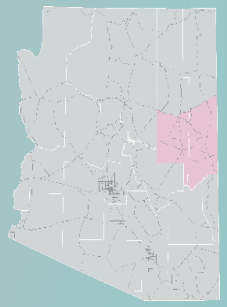
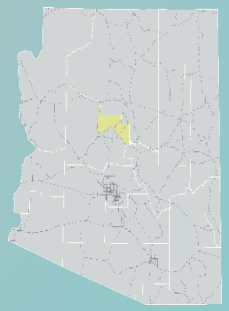
outreach projects funded

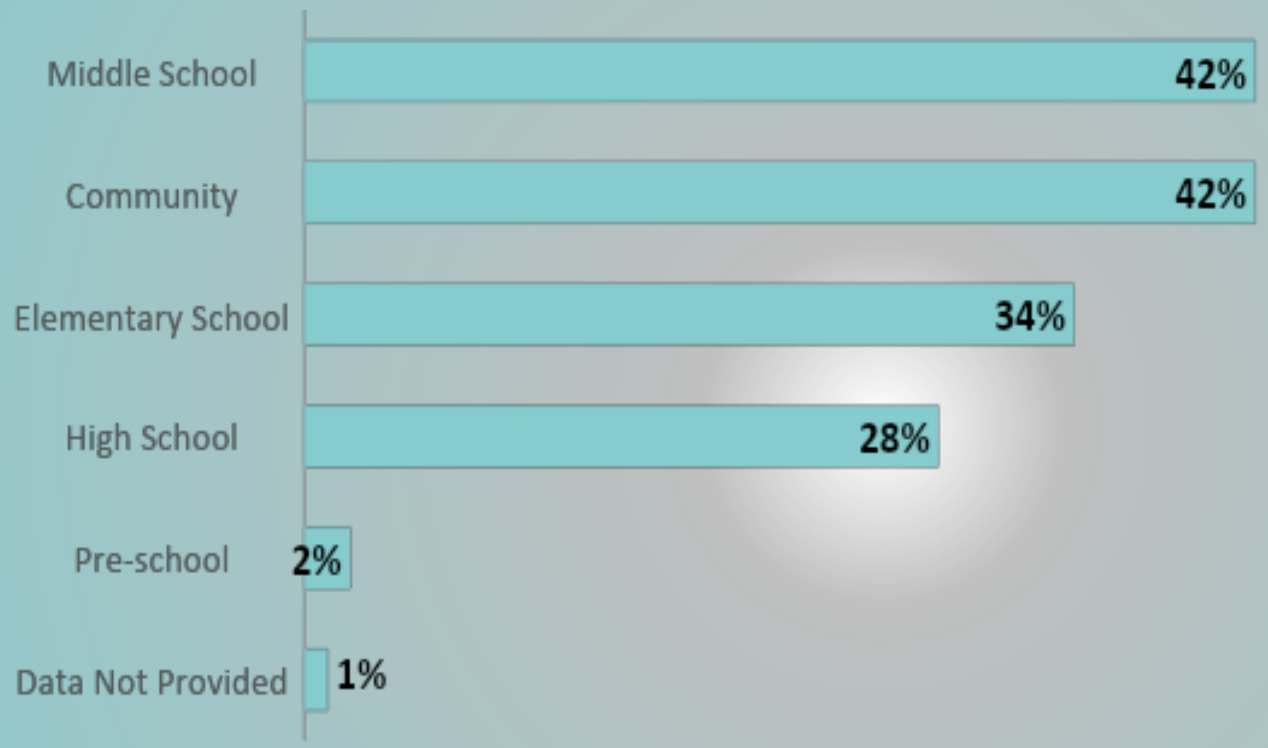


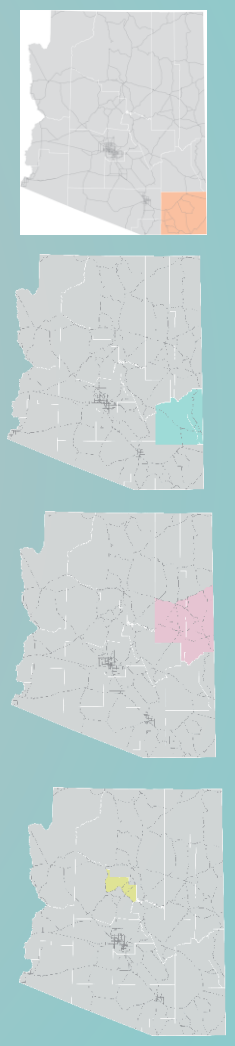






Outreach Audience: Across Regions





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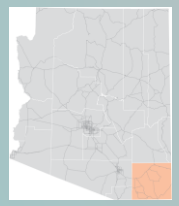
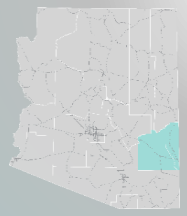
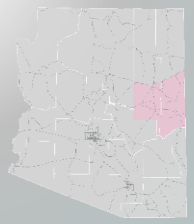
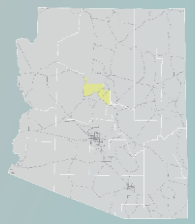
outreach projects funded

Practitioner Impact from Research









Research Implications

Practitioners offering STEM learning opportunities can

- **align attitudes and beliefs** that community members hold about STEM (e.g. its importance for the future and economy, for understanding the world, learning how things work, and solving problems),

and

- their **STEM-related attributes** (e.g., curiosity about the world, interest in learning about how things work, and engaging with new ideas)

Program Considerations

- Offering **practical applications** to everyday life within non-education contexts
- Highlighting **key STEM industries** (e.g. mining, agriculture) in their communities
- Finding ways to make STEM content **personally relevant and appealing** to people

Research Implications

A focus on **local content** offers an opportunity for STEM learning practitioners to **leverage existing STEM industries** (e.g., mining, agriculture) in their communities.

- Increasing awareness of these industries as STEM resources, encouraging community members to learn more, and building partnerships beyond formal education institutions can be strategies for **growing local, place-based STEM identity**.

Research Implications

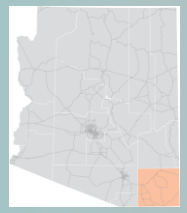
Rural communities could benefit from **investing in educating public audiences** about local STEM assets, expertise, knowledge, jobs, and activities relevant to their rural environments.

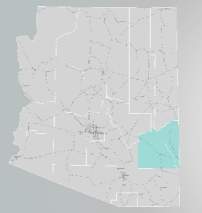
- This appears to be particularly true for topics related to personal and community well-being (e.g. healthcare, food, gardening), which seem to hold both community importance and personal interest across regions.

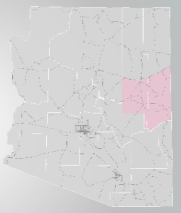
Research Implications

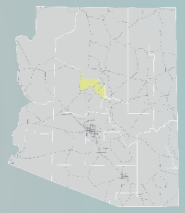
When entering communities or bridging between them, it is important to **consider culturally-specific and locally-informed ways of thinking about place**, including the recognition that definitions of rurality are contextual and widely varying.

RIC Program Audiences

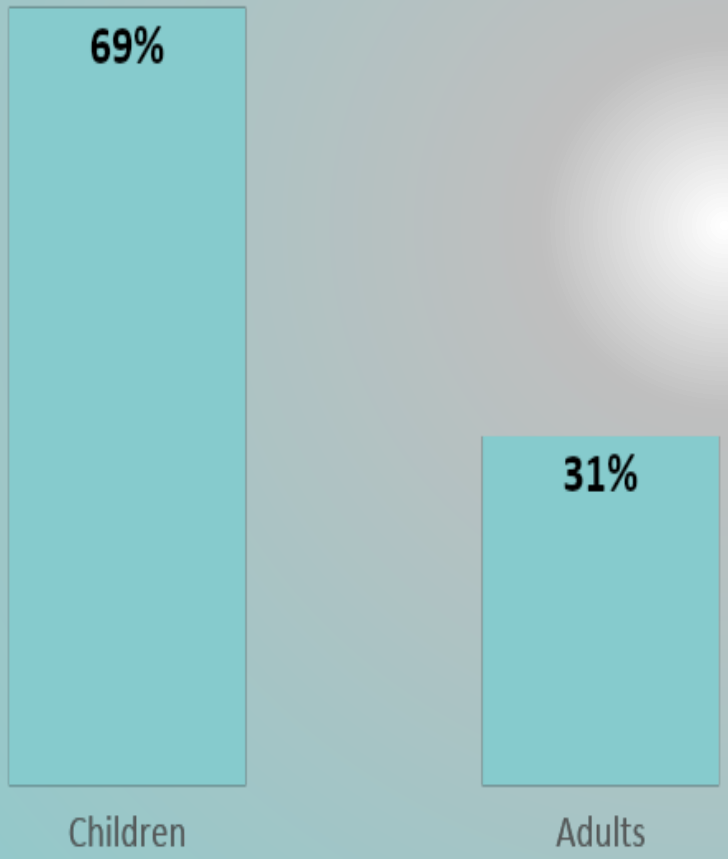








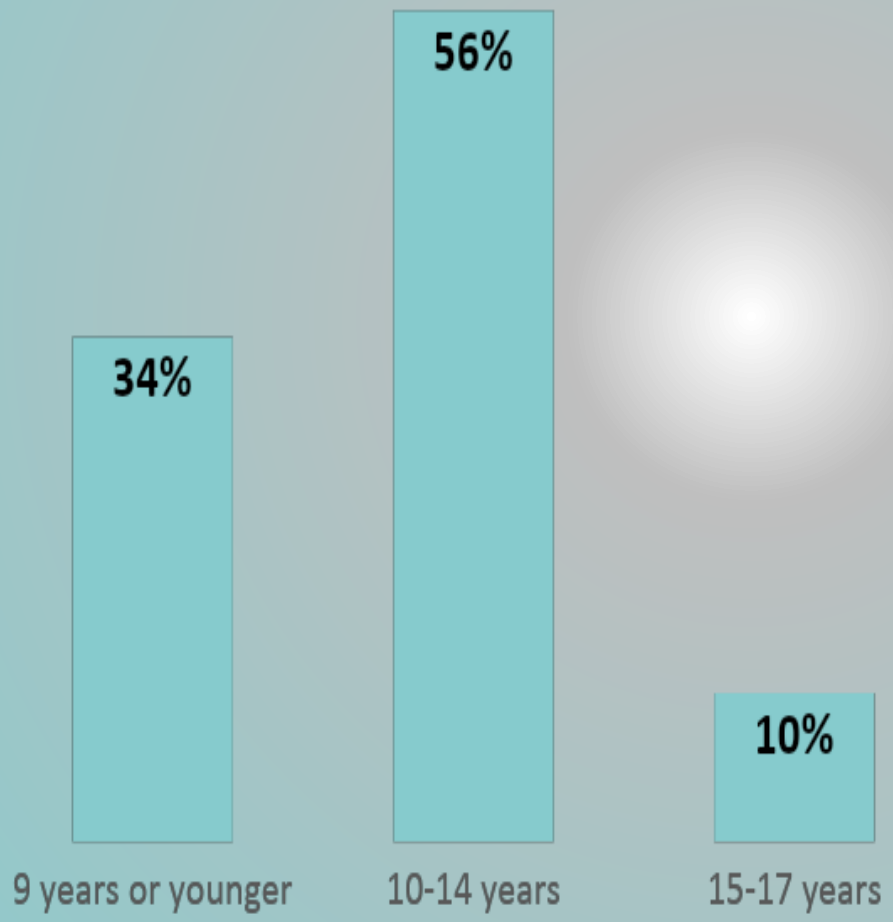
Children were twice as likely to attend outreach events



1104

individuals

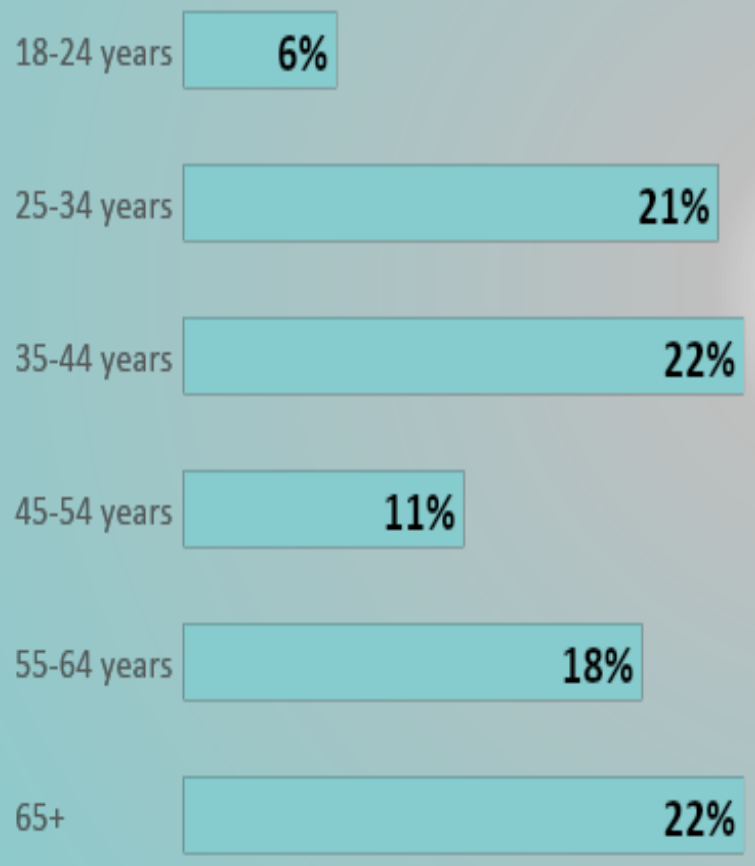
Almost all children were 14 years old or younger



737

children

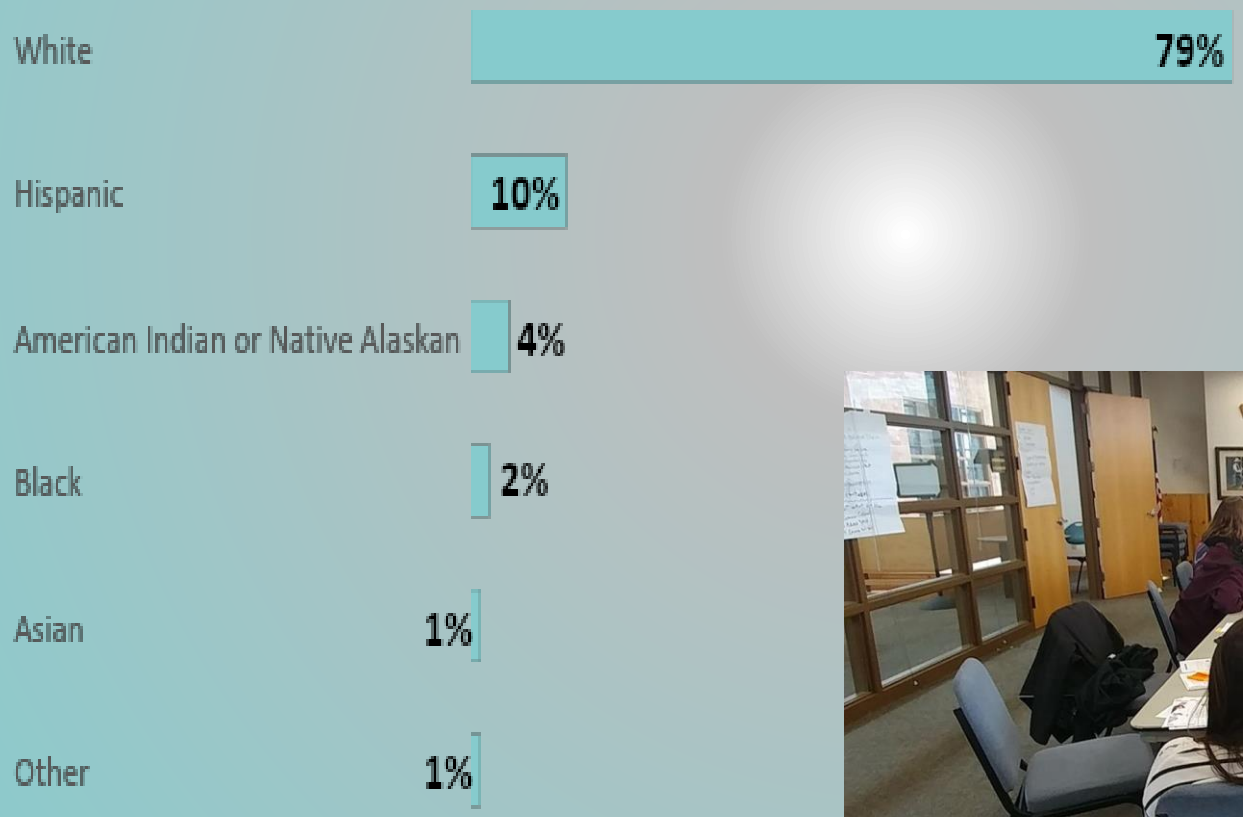
The ages of adult attendees varied, with most being young adults



377

adults

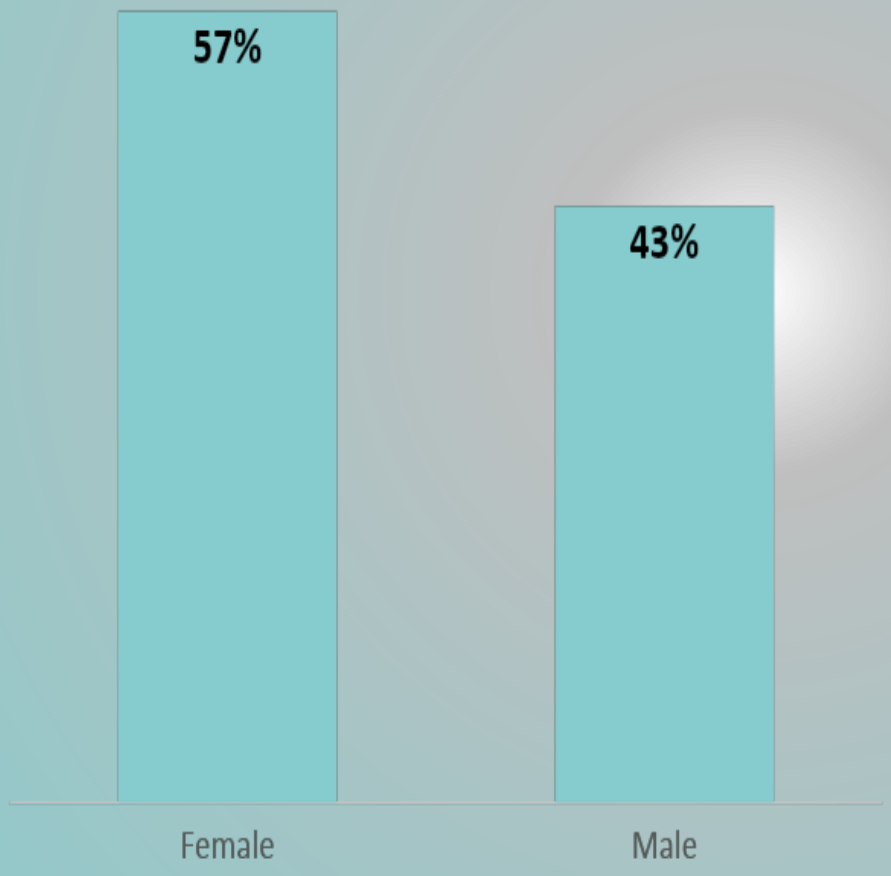
A majority of adult attendees identified as White



377

adults

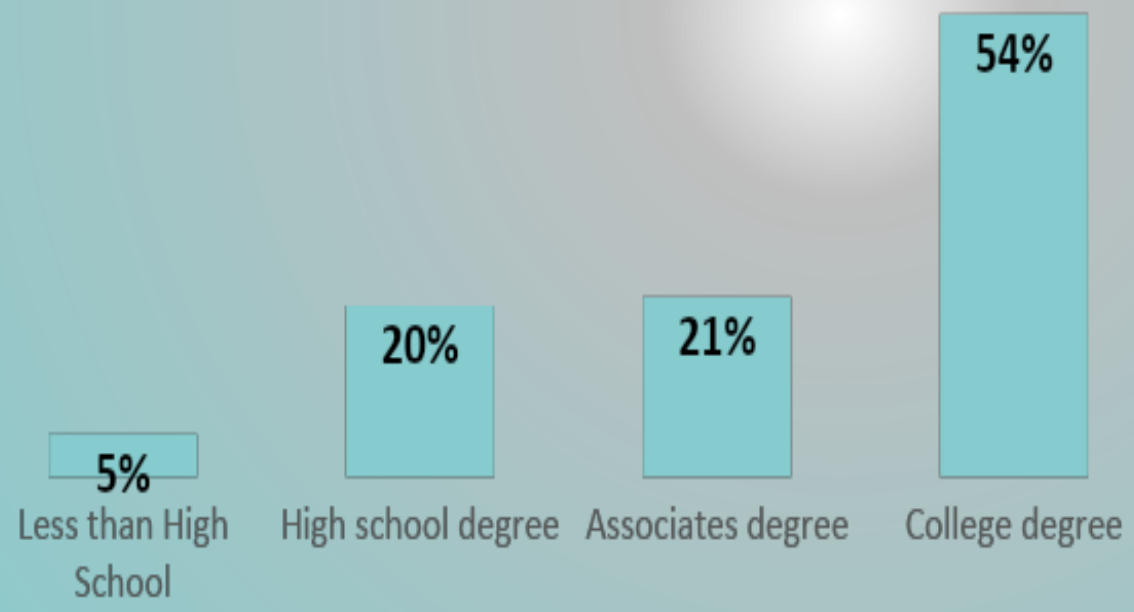
More women than men attended outreach events



377

adults

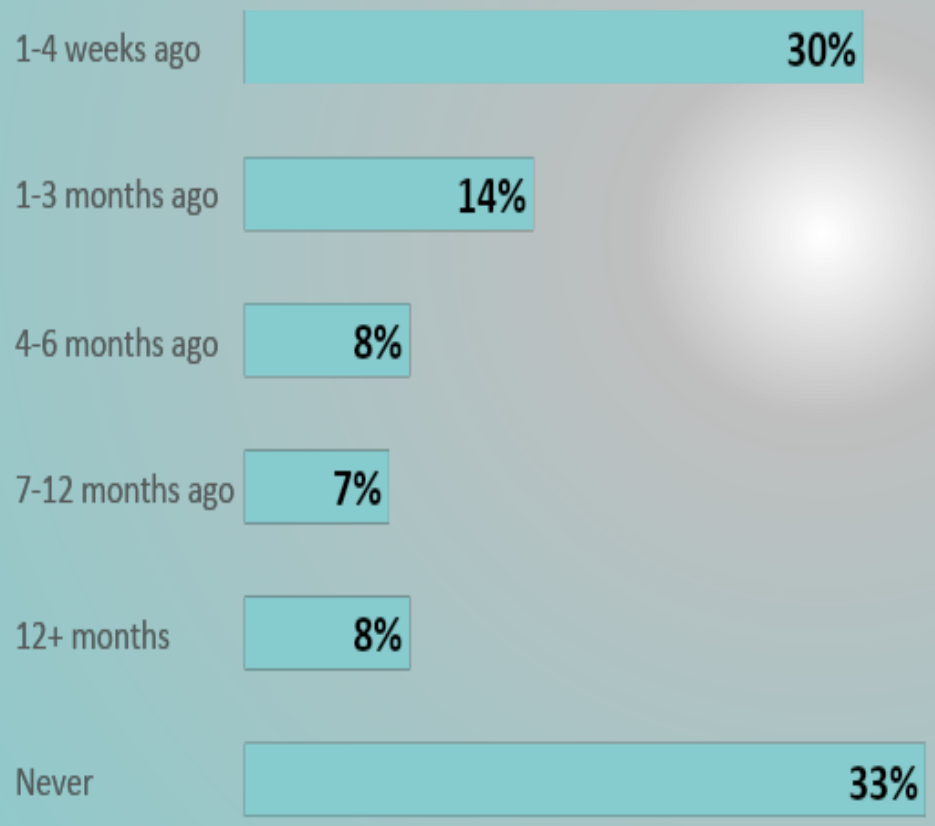
Approximately half of the adult attendees had a college degree



377

adults

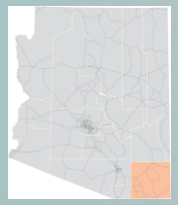
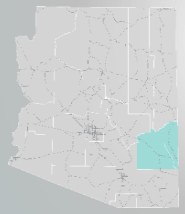
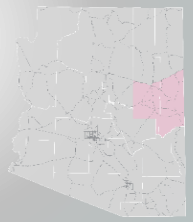
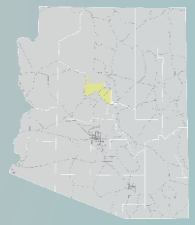
Attendees were split between those who had *never* attended a STEM event and those who had attended a STEM event recently



579

attendees

RAIN Research Findings

How do rural communities perceive, access, and engage in informal STEM learning?

Based on interviews, community focus groups, the Phase 1 community survey (2017), and the Phase 2 community survey (2019)

All regions viewed STEM as potentially important to their communities

- Specifically, important for:
  - The **future** and the **economy**
  - **Understanding the world**, **learning how things work**, and **solving problems**
- Community survey respondents **identified key STEM industries in their region** (e.g., mining, agriculture) as important to their communities, but expressed **less interest in learning more** about these areas

How do rural communities perceive, access, and engage in informal STEM learning?

Based on interviews, community focus groups, the Phase 1 community survey (2017), and the Phase 2 community survey (2019)

All regions viewed STEM did not perceive their communities as having a strong STEM identity.

- There was **stronger explicit value** associated with STEM in **less rural areas**, but all groups perceived STEM resources as limited
- Communities **did not have a shared understanding** of what "local STEM" or "place-based STEM" might include

How, and to what extent, do community members identify themselves and their communities in relation to STEM?

Based on the Phase 1 community survey (2017)

Individual STEM identity: qualitative data

Community members were generally able to draw connections between their everyday activities and STEM domains.

- When asked to provide one example of how they do something related to STEM in their life, community members most frequently connected their examples to their **own work** or **domestic life** and a **generic idea of "STEM."**

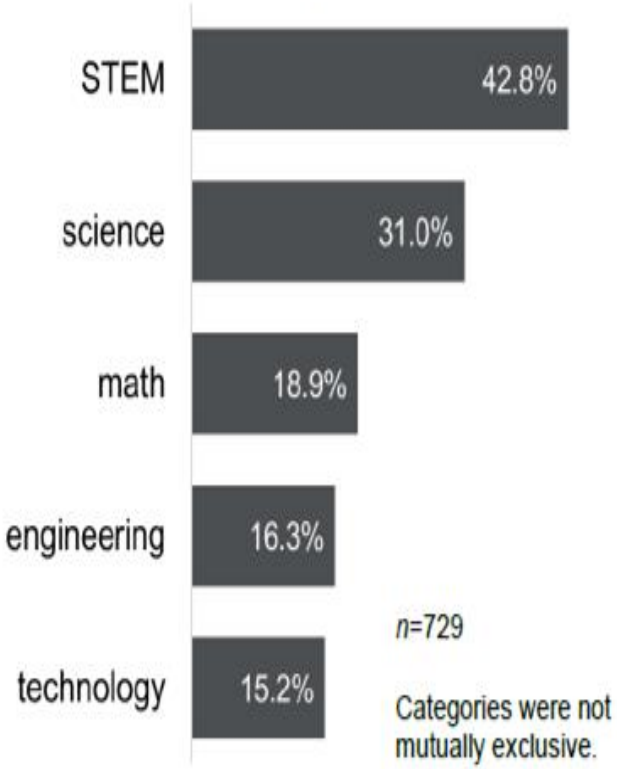
How, and to what extent, do community members identify themselves and their communities in relation to STEM?

Based on the Phase 1 community survey (2017)

Individual STEM identity:

qualitative data

domain:
what was the activity connected to?



motivation-role:
why was the person doing the activity?

Professional - General: 28.8%
The activity was related to the respondent's profession, excluding careers in formal education, informal education, and academic study or apprenticeship (captured separately).

Hobbyist: 27.6%
The activity was a hobby or a necessary household task.

Consumer-User: 16.5%
The activity involved the instrumental use of a consumer product.

Professional - Formal Education: 14.8%
The activity related to the respondent's work in the formal education sector.

Facilitator: 11.5%
The activity involved facilitating a positive experience for someone else.

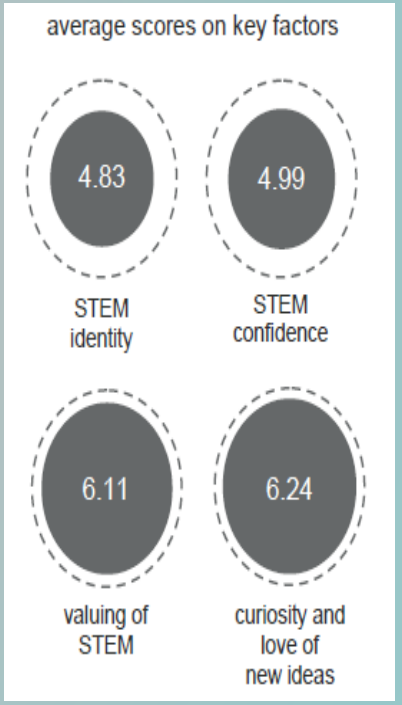
How, and to what extent, do community members identify themselves and their communities in relation to STEM?

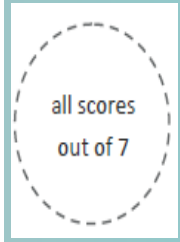
Based on the Phase 1 community survey (2017), with items adapted from Fraser (1978), Halloun & Hestenes (1998), and Semken & Freeman (2008)

Individual STEM identity: quantitative data

There were gaps between moderate personal connection to STEM and strong valuing of STEM.

- Evidence that the term "STEM" can function as a **divider** between ideas of interest and options for engagement
- Stronger explicit **identification** with STEM in **less rural areas**





Fraser, B.L. (1978). Development of a test of science-related attitudes. *Science Education*, *62,* 509-515.

Halloun, I. & Hestenes, D. (1998). Interpreting VASS dimensions and profiles. *Science & Education, 7*(6), 553-577.

Semken, S., & Freeman, C. B. (2008). Sense of place in the practice and assessment of place-based science teaching. *Science Education, 92*(6), 1042-1057.

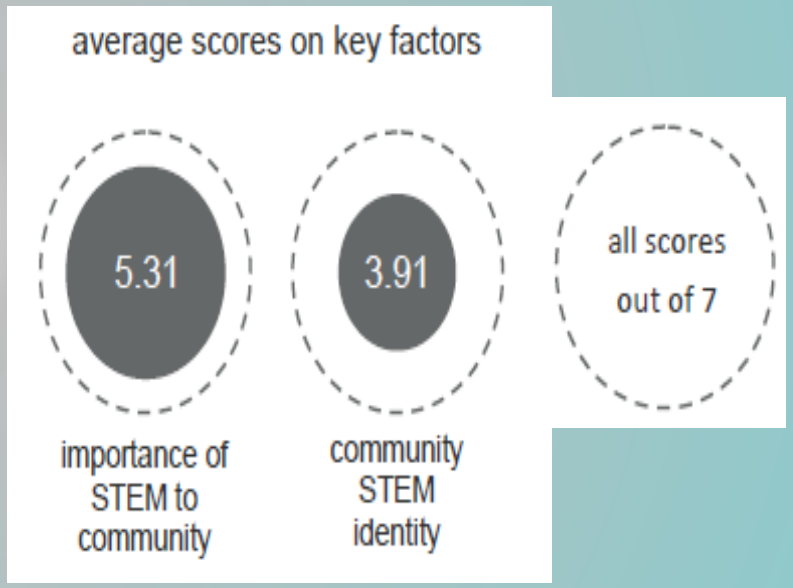
How, and to what extent, do community members identify themselves and their communities in relation to STEM?

Based on the Phase 1 community survey (2017)

Collective STEM identity: STEM and place

All regions viewed STEM as potentially important to community life, but did not perceive strong identity in relation to STEM.

- Stronger explicit **value** associated with STEM in less rural areas, but **all groups** perceived STEM **resources as limited**



How, and to what extent, do community members identify themselves and their communities in relation to STEM?

Based on the Phase 2 community survey (2019) (n=366)

Collective STEM identity: STEM and place

Exploratory factor analysis suggested five main areas of community STEM identity based on community members' ratings of their importance.

How, and to what extent, do community members identify themselves and their communities in relation to STEM?

Based on the Phase 2 community survey (2019) (n=366)

Collective STEM identity: STEM and place

Differences in local "brand" of STEM emerged in each region.

- Community importance (C) was consistently rated **higher** than personal interest (P) in all areas

	Navapache	Graham G.	Verde V.	Cochise
knowledge industry		C P		C
outdoor industry	P	C P		
food & gardening	C P	P		C
recreation & tourism	P		C P	C P
community services	C	P	C	

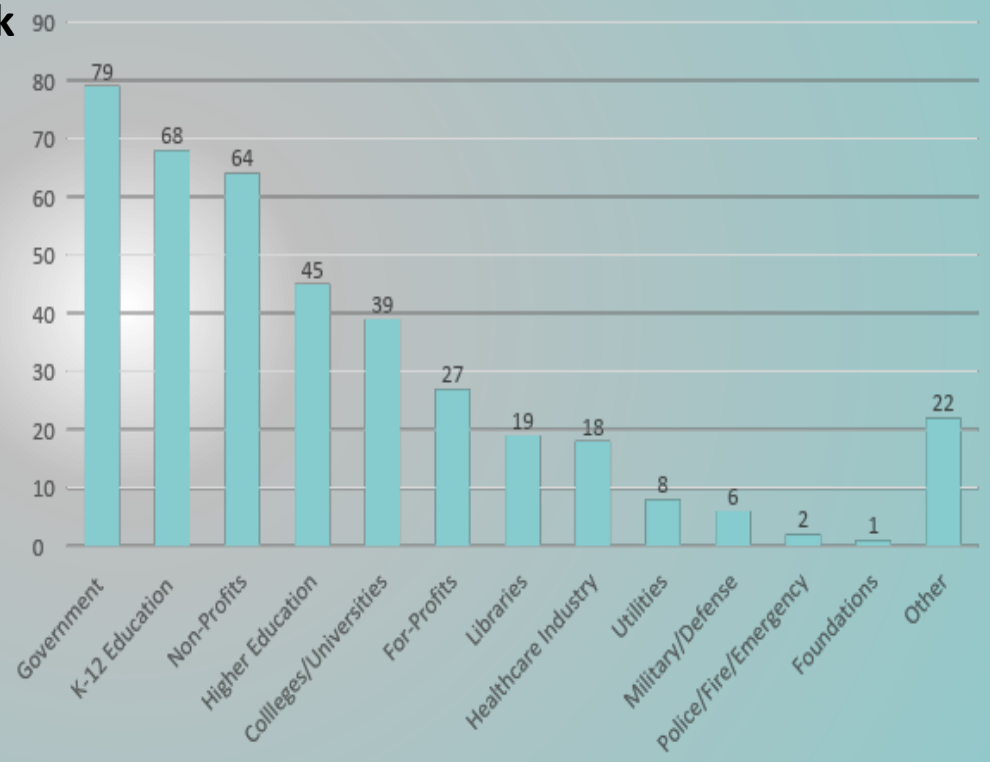
C = community importance score higher than average
P = personal interest score higher than average

How do networks foster STEM related identity at personal & community levels?

Findings based on Phase 2 distribution of RIC member survey (44 respondents across all four regions identifying 404 individuals or entities)

Represented as part of the STEM network

- Government, K-12, and non-profit participation highly represented
- Higher education, including colleges and universities are central
- For-profits, libraries, and healthcare industry are moderately represented
- High STEM influence from people, organizations, and institutions that were not frequently identified (i.e. utilities, military/defense, police/fire/emergency, and foundations

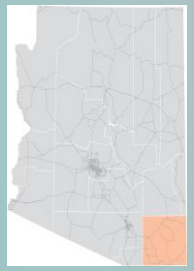
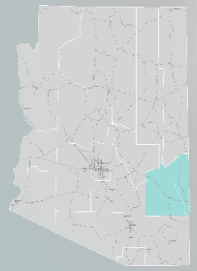
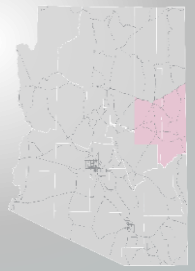
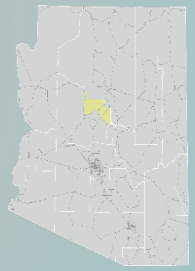


How do networks foster STEM related identity at personal & community levels?

Findings based on Phase 2 distribution of RIC member survey (44 respondents across all four regions identifying 404 individuals or entities)

- The strong shared understanding among higher education and governmental agencies could be built upon through participation from sectors with low representation and through careful cross-sector communication. (CC, GG, VV)
- There are many vital partnerships in the region; dominated by government, K-12, non-profits, and higher education, but very diverse otherwise, especially at the core of the network of vital STEM partnerships.
- Those whose greater participation could contribute to the local STEM environment were very diverse, including institutions of higher education, K-12 schools, public entities, libraries, local science centers, City Chambers of Commerce, civic organizations, healthcare industry, and many different kinds of businesses.

RAIN Research Methods

Research Methods

The research team used a **mixed methods approach** (qualitative and quantitative) to collect and analyze data during each of the three phases of this study, address the research questions, and to create an overall narrative for this study.

Qualitative approaches

- **RIC member and community partner interviews** (n=43) (Phase 1: See slide 8)
- **Community focus groups** (n=12) (Phase 1: See slide 8)
- **Literature review** (Phase 1: See slide 8)
- **RIC member interviews** (n=19) (Phase 2: See slide 9)
- **RIC member interviews** (n=21) (Phase 3: See slide 10)
- **RAIN governance COVID-19 response interviews** (n=3) (Phase 3: See slide 10)

Rationale: The research team used qualitative approaches to allow for in-depth exploration of more targeted issues, richer contextual understanding, and opportunities for RICs to describe their work in their own words.

Quantitative approaches

- **Community Member survey** (n=1,004) (Phase 1: See slide 8)
- **Community member survey** (n=572) (Phase 2: See slide 9)
- **RIC member COVID-19 response questionnaire** (n=15) (Phase 3: See slide 10)

Rationale: The research team used survey questionnaires to collect a volume of data that that could be analyzed using statistics, aggregated and/or compared across regions, and potentially generalized.

Research Methods

Links to coding rubrics (accessible by RAIN Leadership Team)

- Phase 1 and 2 RIC interviews and Phase 1 community focus groups:

2017-06-07_RIC Interviews Qualitative data coding rubric

- Open-ended question on Phase 1 community survey:

RAIN Phase 1 Community Survey_Q7 Coding Rubric_010418_clean copy

- New questions in Phase 2 RIC interviews:

RAIN_Phase 2 RIC Interviews_Q2&Q3_codebook

Phase 3 RIC interviews:

2020_05_01 Phase 3 RIC interviews Qualitative data coding rubric

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