EDU | DIRECTORATE FOR STEM EDUCATION

Directorate for STEM Education 2024 Spring Advisory Committee Meeting

"Rural and Remote Communities: Examining Ways to Unleash STEM Education and Workforce Opportunities"

U.S. National Science Foundation
Directorate for STEM Education

Preparing a diverse STEM workforce and a well-informed citizenry

EDU | DIRECTORATE FOR STEM EDUCATION

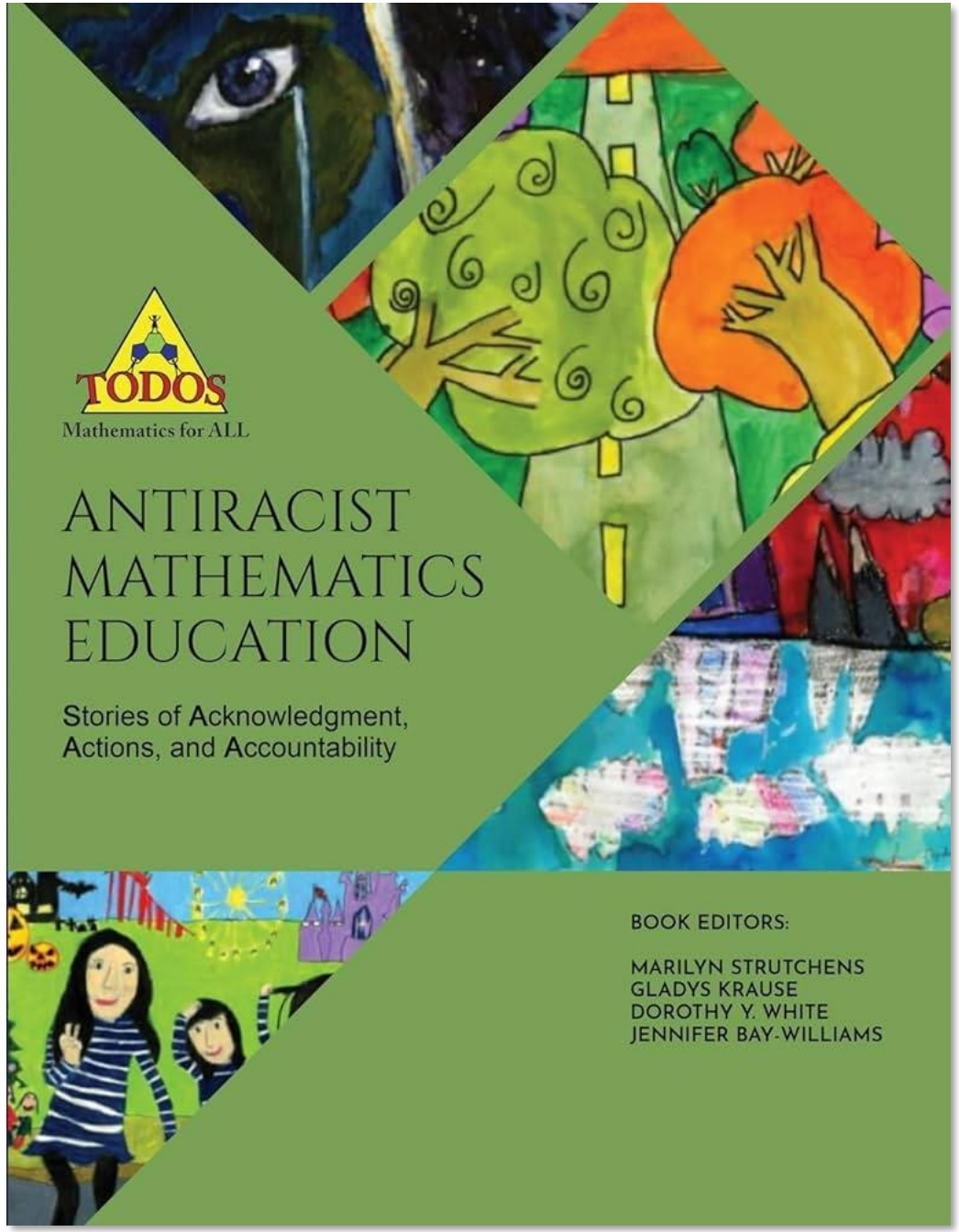
Directorate for STEM Education 2024 Spring Advisory Committee Meeting:

AC Chair Update

DR. MARILYN STRUTCHENS

EMILY R. AND GERALD S. LEISCHUCK ENDOWED PROFESSOR
AUBURN UNIVERSITY

May 29, 2024


TODOS
Mathematics for ALL
ANTIRACIST MATHEMATICS EDUCATION
Stories of Acknowledgment, Actions, and Accountability
BOOK EDITORS:
MARILYN STRUTCHENS
GLADYS KRAUSE
DOROTHY Y. WHITE
JENNIFER BAY-WILLIAMS

EDU | DIRECTORATE FOR STEM EDUCATION

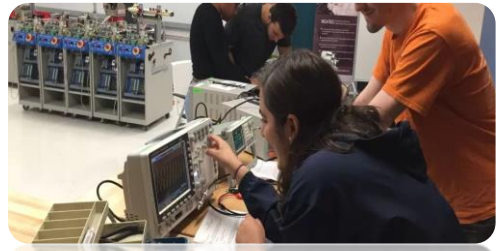
Directorate for STEM Education 2024 Spring Advisory Committee Meeting:

STEM Education Updates

DR. JAMES L. MOORE III
ASSISTANT DIRECTOR, STEM EDUCATION
May 29, 2024

EDU | DIRECTORATE FOR STEM EDUCATION

Rice's OpenStax awarded $90M to lead first-of-its-kind NSF research hub for transformational learning and education research



SafeInsights brings together researchers, educational institutions and digital learning platforms to enable timely, impactful studies designed to overcome the challenges faced in education

SafeInsights

U.S. National Science Foundation
Directorate for STEM Education

Preparing a diverse STEM workforce and a well-informed citizenry

AUDIENCE AWARD
Beijing International Film Festival
2024

BEST SCIENCE FILM
Beijing International Film Festival
2024

OFFICIAL SELECTION
Wild & Scenic Film Festival
2024

OFFICIAL SELECTION
International Ocean Film Festival
2024

OFFICIAL SELECTION
World Whale Film Festival
2024

OFFICIAL SELECTION
Ocean Films Húsavík
2024

OFFICIAL SELECTION
International Wildlife Film Festival
2024

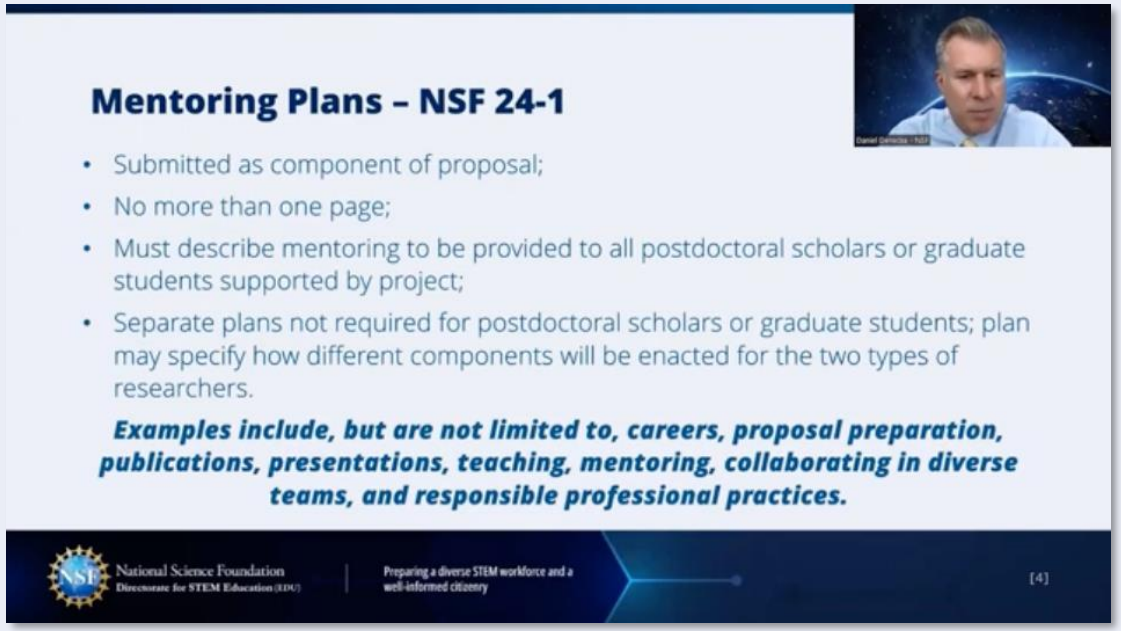
UPDATE

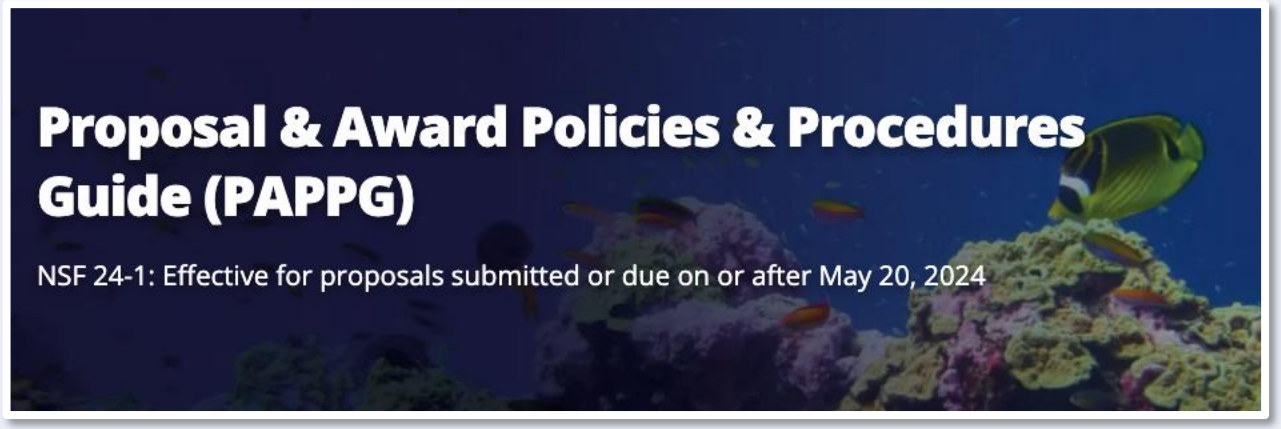
NSF announces pilot phase for summer 2024 and anticipated opening date (fall 2024) of Arecibo C3 at the site of the NSF Arecibo Observatory Historic District in Puerto Rico

U.S. National Science Foundation
Directorate for STEM Education

Preparing a diverse STEM workforce and a well-informed citizenry

New Mentoring Requirements for Graduate Students

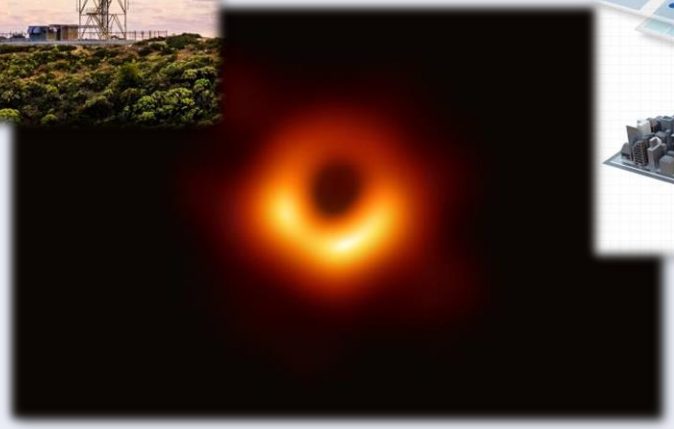




Daniel Denecke, DGE Program Officer, presenting at the Council of Graduate Schools webinar

NATIONAL SCIENCE BOARD
SCIENCE & SOCIETY AWARD
NSB
AdvanceKentucky Influencer Model
Sheri McGuffin, Ph.D., AdvanceKentucky STEM Coordinator
Kentucky Science and Technology Corporation (KSTC)
Eric Wooldridge, PE, RA, MsEng
Engineering Professor, Somerset Community College, Curriculum Designer

NSF 75th Anniversary



Share YOUR impact stories!

NEW

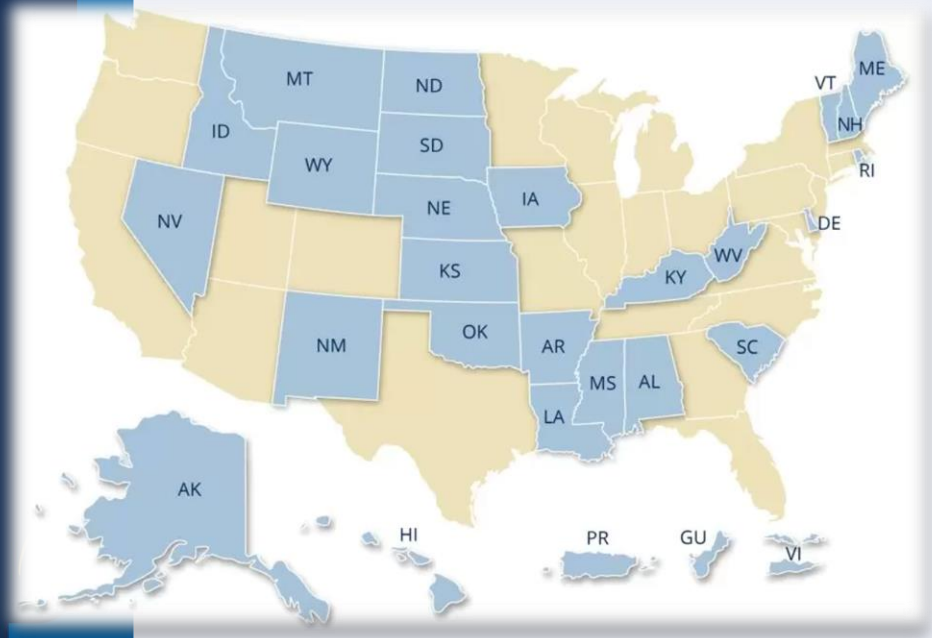
National Science Foundation | Directorate for STEM Education (EDU)

DEAR COLLEAGUE LETTER (DCL):

Enhancing STEM Education, Research Capacity, and Workforce Development in Established Program to Stimulate Competitive Research (EPSCoR) Jurisdictions

NSF 24-077 | April 11, 2024

Through this DCL, EDU encourages new proposal submissions to EDU programs and supplemental funding requests to existing EDU awards led by institutions in the 28 EPSCoR jurisdictions. In order to achieve this, EDU seeks increased accessibility to the ideas, opportunities, and tools of STEM education and research for students, educators, researchers, communities at all levels and in all settings (both formal and informal), and by the public in EPSCoR jurisdictions, which historically receive less STEM education funding than other regions of the country.



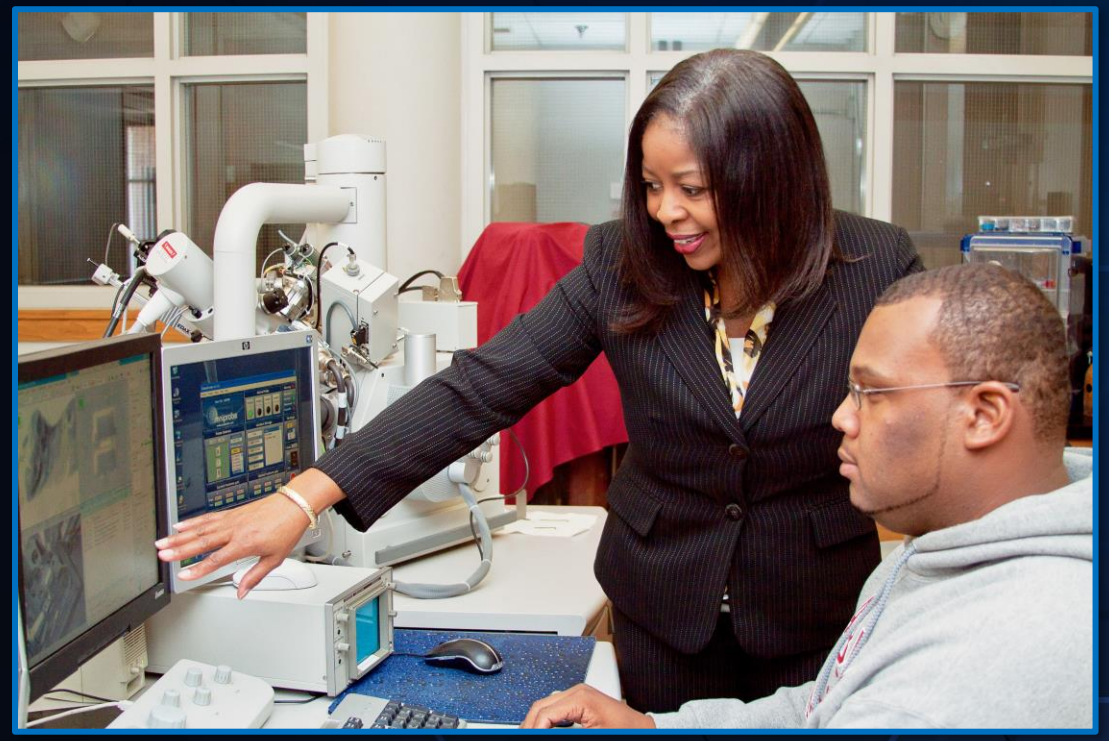
U.S. National Science Foundation

NEW
EPSCoR Centers of Research Excellence in Science and Technology (EPSCoR CREST Centers)

NRT Institutional Partnership Pilot Program

The program invites proposals to test, develop and implement innovative and effective STEM graduate education models leading to industry-relevant graduate programs at non-R1 institutions. Institutions will collaborate with industry partners and partners at IHEs who have successfully implemented or are implementing NRT projects.

CREST – Research Infrastructure for Science and Engineering (CREST-RISE)



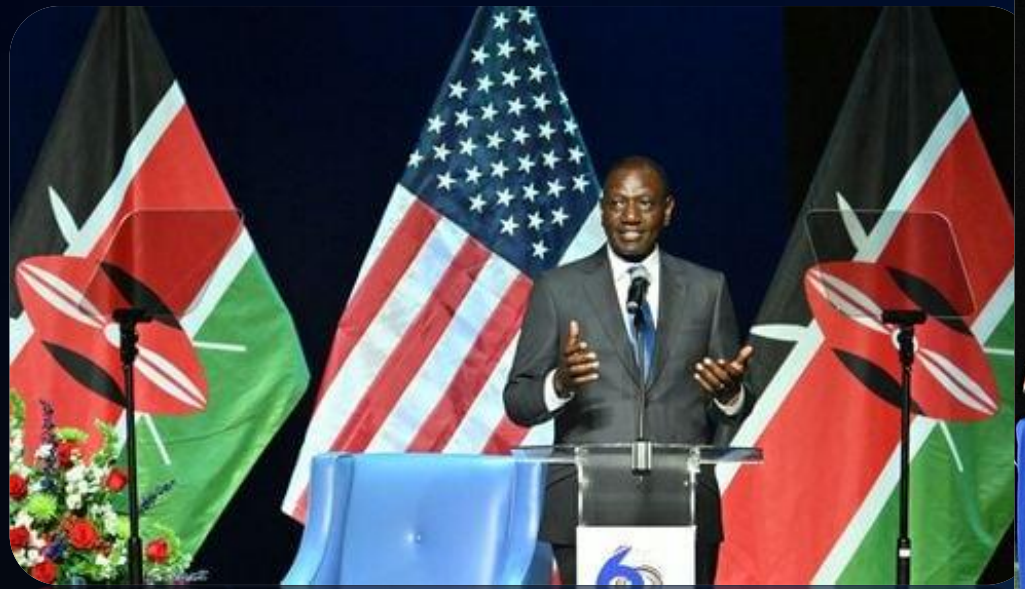
Supports the expansion of research and education capabilities of minority-serving institutions to strengthen their science and engineering graduate programs and the successful production of research doctoral students.

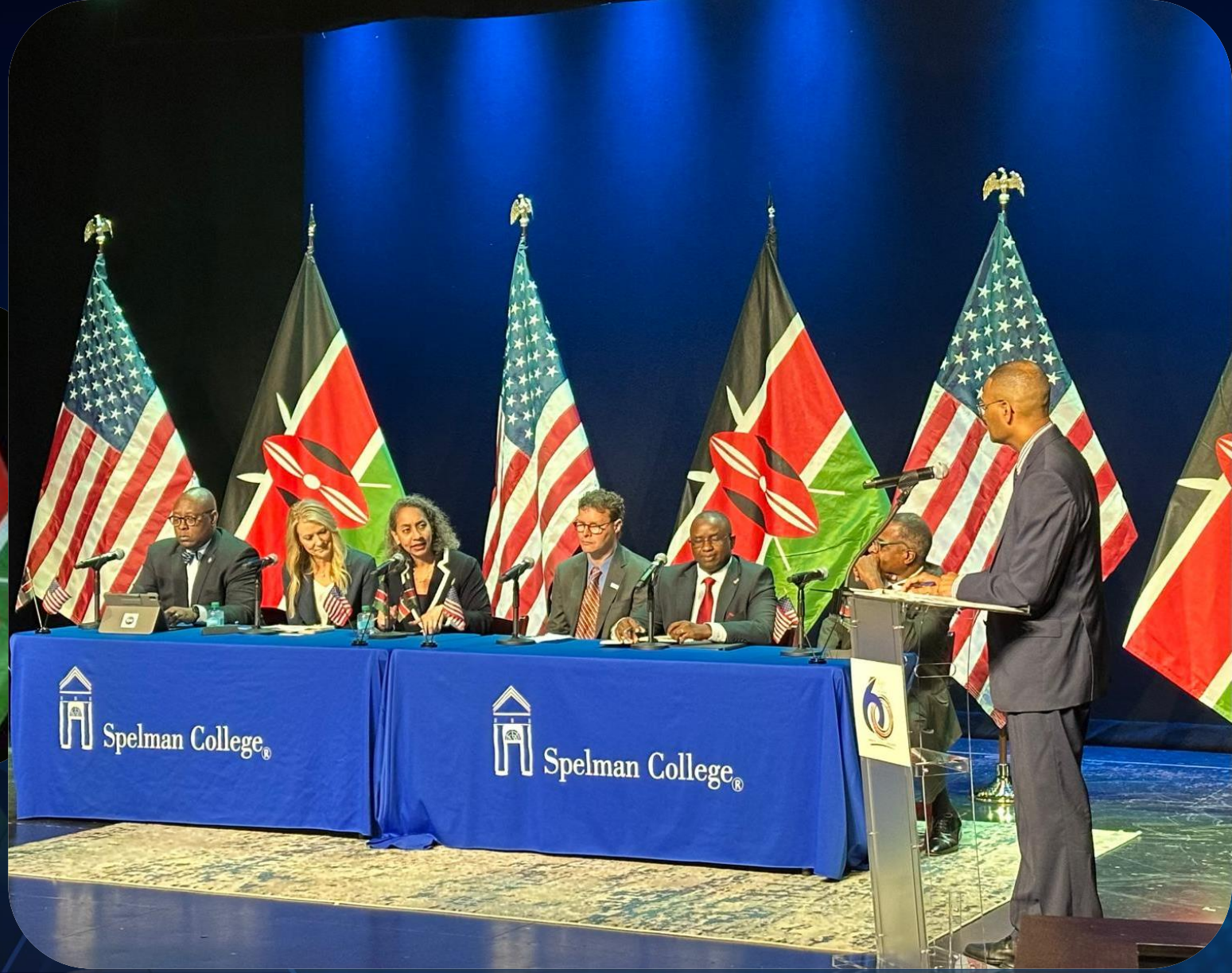
IUSE/Professional Formation of Engineers: Revolutionizing Engineering Departments (IUSE/PFE: RED)

Supports fundamental changes to the training of undergraduate engineering students that equip them with the technical and professional skills needed to solve complex societal problems.

National STEM Teacher Corps Pilot Program

EDU | DIRECTORATE FOR STEM EDUCATION





U.S. National Science Foundation
Directorate for STEM Education

Preparing a diverse STEM workforce and a well-informed citizenry

Recommendations Across the Lifecycle for Direct Partnerships with the Directorate for STEM Education

A Report to the

Directorate for STEM Education

by the

NSF Federal Advisory Committee for Education and Human Resources

Subcommittee on Leveraging Partnerships to Reach the Missing Millions

May 28, 2023

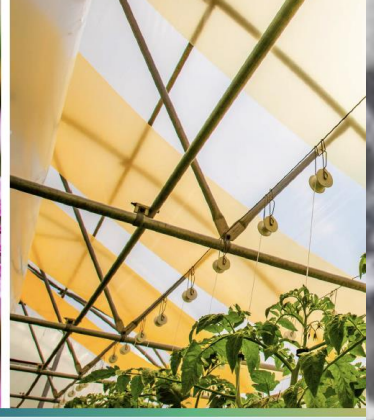
Thank you!

U.S. National Science Foundation
Directorate for STEM Education

Preparing a diverse STEM workforce and a well-informed citizenry

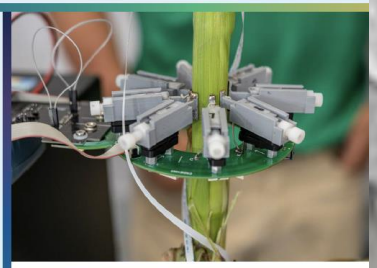
SESSION 1: Understanding Rural STEM Education and Workforce Development

Moderator: Dr. Jackie Huntoon
Dr. Tabbatha Dobbins
Dr. Toni Dancstep
Dr. Mike Rook



MAKING **VISIBLE** the INVISIBLE:
STEM Talent of **Rural** America

2024 CEOSE Report to Congress



Making Visible the Invisible: STEM Talent of Rural America

2024 CEOSE Special Report to Congress

WRITING COMMITTEE MEMBERS

Tabbetha Dobbins, PhD (Writing Lead) | Suzanne Barbour, PhD (CEOSE Chair)| Jose Fuentes, PhD (Former CEOSE Chair) | Kaye Husbands-Fealing, PhD (Former CEOSE Chair) | Cynthia Lindquist, PhD | James Martin II, PhD

NSF LIAISONS

Bernice Anderson and Alicia Knoedler

CONSULTANTS

Trewon Technologies (Aubrey Comperatore, Wilnise Horsey, Mia Brown, Marianne Starks, Laura Wilson), Valentina Atela, Steven Buhneing, Gabriel Fabre, Gavin Flowers, Amanda Meyers

rural STEM EDUCATION

STEM TECHNOLOGY ENGINEERING MATH

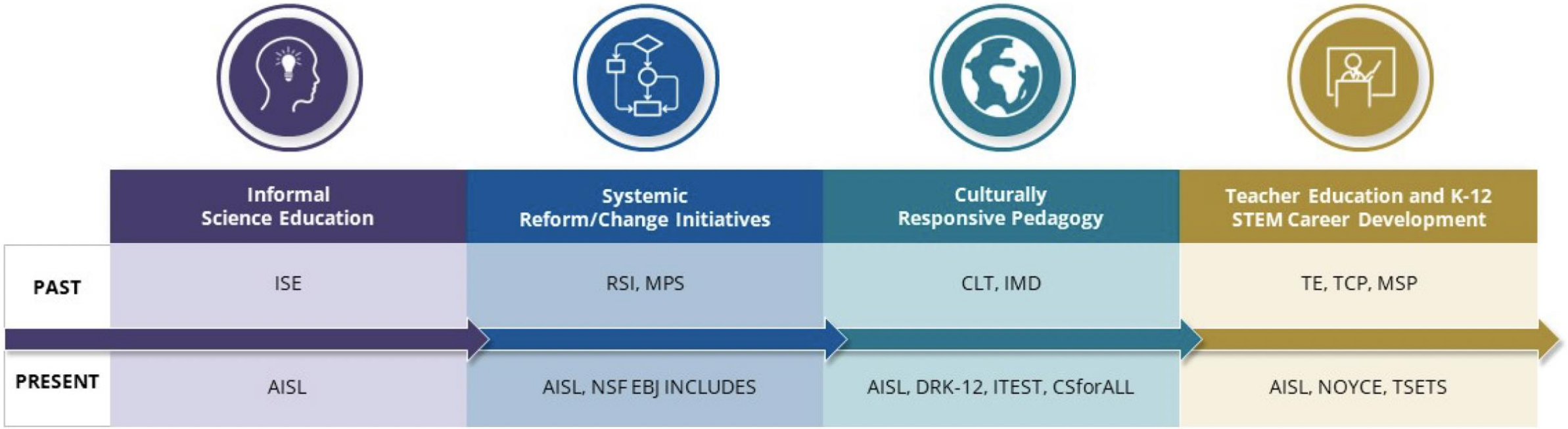
CEOSE Special Report that includes:

- a description of past and present policies and activities of the Foundation to encourage full participation of students in rural communities in STEM fields;

- an assessment of trends in participation of rural students in prekindergarten through grade 12 in Foundation activities; and,

- an assessment of the policies and activities of the Foundation, along with proposals for new strategies or the broadening of existing successful strategies, to increase participation in Foundation STEM activities.

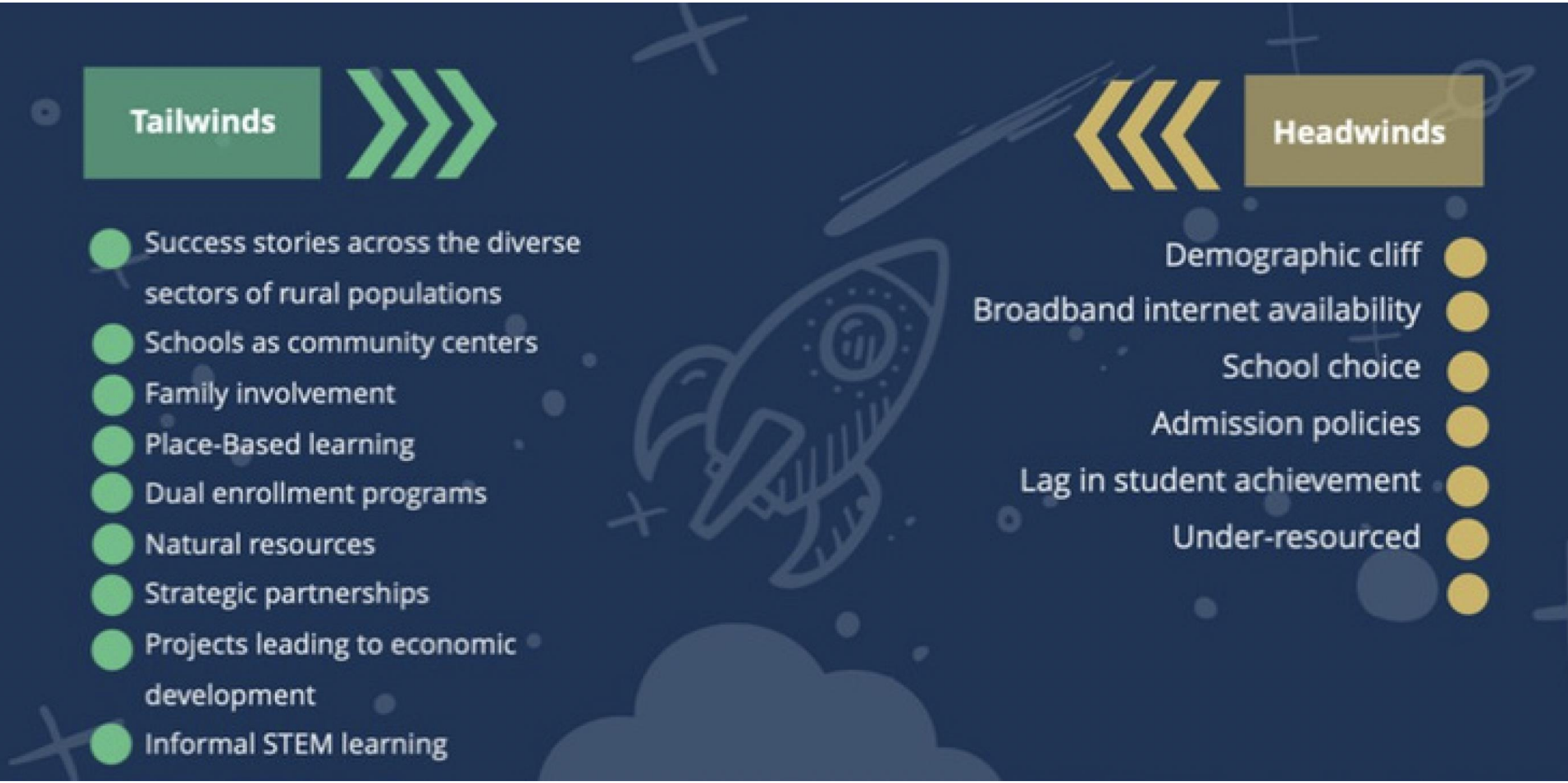
PAST, PRESENT POLICIES AND ACTIVITIES



PAST, PRESENT POLICIES AND ACTIVITIES

Tailwinds

- Success stories across the diverse sectors of rural populations
- Schools as community centers
- Family involvement
- Place-Based learning
- Dual enrollment programs
- Natural resources
- Strategic partnerships
- Projects leading to economic development
- Informal STEM learning



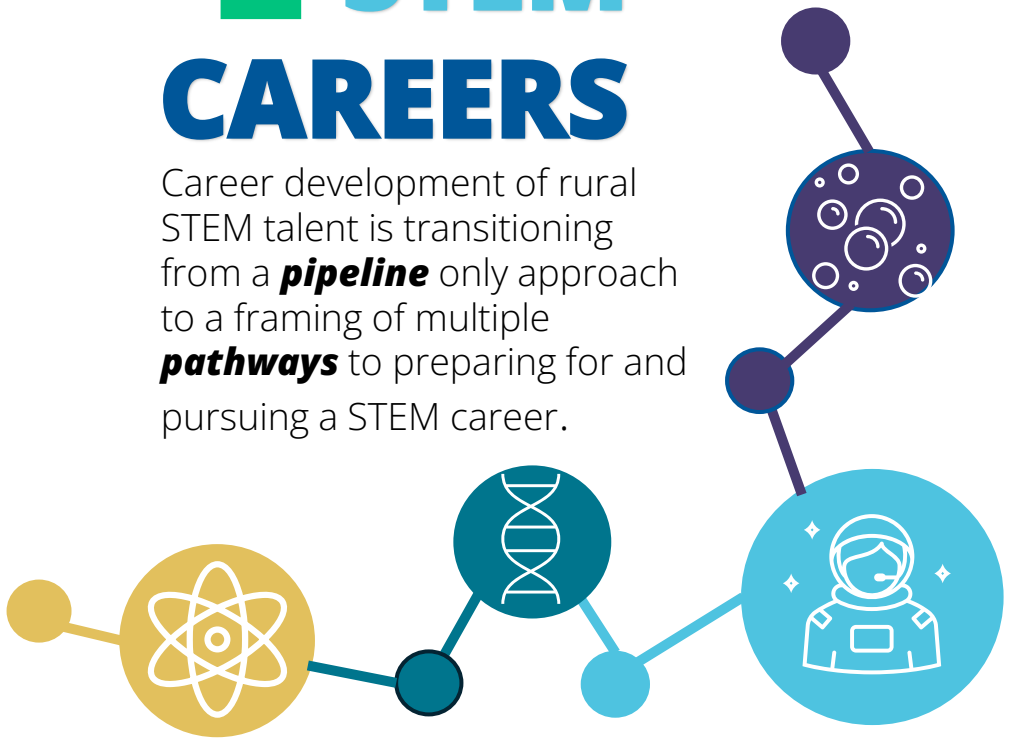
Headwinds

- Demographic cliff
- Broadband internet availability
- School choice
- Admission policies
- Lag in student achievement
- Under-resourced

FOUR TRENDS IN K-12 STUDENT PARTICIPATION

4 STEM CAREERS

Career development of rural STEM talent is transitioning from a ***pipeline*** only approach to a framing of multiple ***pathways*** to preparing for and pursuing a STEM career.



1 PARTNERING RELATIONSHIPS

Different types of ***partnering relationships*** have emerged over time.

2 REMOTE STEM EDUCATION

Research has increased regarding ***remote STEM education***.

CUTTING-EDGE OPPORTUNITIES

NSF is supporting a wide range of ***cutting-edge opportunities*** for increasing and strengthening the STEM learning experience at the K-12 level.

3

Overall Assessment of NSF Policies and Activities

a genuine commitment for agency policies and practices to be **inclusive** of rural communities.

a **longstanding history** of varied K-12 activities for K-12 students and teachers in rural school.

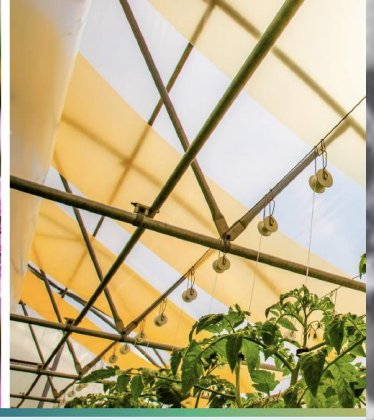
a division/directorate leading efforts to ensure that NSF has a **significant** rural STEM education portfolio.

a need for increased funding to address **inequities** and **disparities** among rural communities to:

- continue and replicate successful practices and
- support innovative efforts that transform challenges into promising and innovative opportunities to help rural K-12 students excel in STEM education.

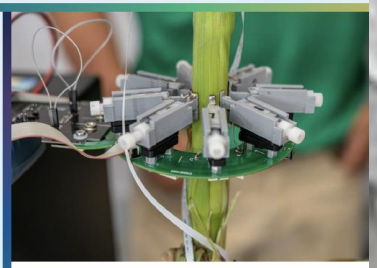
SUGGESTIONS ALIGNED WITH NSF OBJECTIVES

1. Widespread STEM Literacy
2. Access to High Quality STEM Learning and Training
3. Early Engagement with the Research Community
4. Access to High Quality STEM Learning and Training



MAKING **VISIBLE** the INVISIBLE:
STEM Talent of **Rural** America

2024 CEOSE Report to Congress



Q&A

K-12 STEM Education and Workforce Development in Rural Areas

National Academies Consensus Study

CHIPS+ Science Act
directed NSF to support
National Academies to conduct
a consensus study on
preK-12 rural STEM education and workforce development

The National Academies will

1. **evaluate the quality and quantity of current federal programming and research** directed at examining STEM education (in both formal and informal settings) for students in prekindergarten through grade 12 and workforce development in rural areas;
2. in coordination with the Federal Communications Commission, **assess the impact that the scarcity of broadband connectivity in rural communities, and the affordability of broadband connectivity, have on STEM and technical literacy** for students in prekindergarten through grade 12 in rural areas;
3. **assess the core research and data needed to understand the challenges rural areas are facing** in providing quality STEM education (in formal and informal settings) and workforce development, **as well as the assets embedded in these communities**;
4. **make recommendations for action at the federal, state, and local levels** for improving STEM education, including online STEM education, for students in prekindergarten through grade 12 and workforce development in rural areas (whenever possible, findings and recommendations for preK-12 STEM education and workforce development in rural areas will be disaggregated to identify and address regional, racial/ethnic, and economic variability); and
5. **make recommendations to inform the implementation of programs** in sections 10512 (“National Science Foundation Rural STEM Activities”) and 10513 (“Opportunities for Online Education”), **which include the National Science Foundation's funding** for rural STEM activities and online STEM education and mentoring in rural communities.

Committee

CO-CHAIR
Katharine G. Frase

CO-CHAIR
Tiffany Neill

MEMBER
Juan-Carlos Aguilar

MEMBER
Bradley S. Barker

MEMBER
Gloria Burnett

MEMBER
Linda Furuto

MEMBER
Rebekah Jane Hammack

MEMBER
Eric J. Jolly

MEMBER
John P. McNamara

MEMBER
Audrey Meador

MEMBER
Darris R. Means

MEMBER
Stephen L. Pruitt

MEMBER
Jessica Sampley

MEMBER
Guan Kung Saw

MEMBER
Mara Casey Tieken

STAFF OFFICER
Elizabeth Cady

Public session recordings

Past Events

MEETING

MAR 25

MULTIDAY EVENT | MARCH 25-27, 2024

K-12 STEM Education and Workforce Development in Rural Areas, Committee Meeting 3 >

JAN 23

MULTIDAY EVENT | JANUARY 23-24, 2024

K-12 STEM Education and Workforce Development in Rural Areas, Committee Meeting 2 >

MEETING

NOV 6

MULTIDAY EVENT | NOVEMBER 6-7, 2023

K-12 STEM Education and Workforce Development in Rural Areas, Committee Meeting 1 >

PreK-12 STEM Education & Workforce Development in Rural Areas

NATIONAL ACADEMIES will

1. evaluate the quality and quantity of current federal programming and research
2. assess the impact that the scarcity of broadband connectivity in rural communities, and the affordability of broadband connectivity, have on STEM and technical literacy
3. assess the core research and data needed to understand the challenges rural areas are facing, as well as the assets embedded in these communities;
4. make recommendations for action at the federal, state, and local levels for improving STEM education; and
5. make recommendations to inform the implementation of programs in sections 10512 (“National Science Foundation Rural STEM Activities”) and 10513 (“Opportunities for Online Education”), which include the National Science Foundation's funding for rural STEM activities and online STEM education and mentoring in rural communities.

EDU | DIRECTORATE FOR STEM EDUCATION

NSF's Directorate for STEM Education:

Active awards on rural topics and in nonmetro locales

Michael M. Rook, Ph.D.
Program Evaluator, NSF/EDU/Office of the Assistant Director
May 29, 2024

Defining “rural”: Census and OMB

U.S. Census Bureau defines “Urban” and “Rural” based on census block

- Urban areas are based on a minimum threshold of 2,000 housing units or 5,000 people.
- Rural areas encompass all areas outside an urban area (66.3 million or ~20% people live in rural areas as of 2020).

U.S. Office of Management and Budget (OMB) defines “Metro” and “Nonmetro” based on county

- Metro areas are based on counties within the commuting zones of urban entities with a minimum threshold of 50,000 people.
- Nonmetro areas encompass all outside a metro area or commuting zones (46 million or ~14% people live in nonmetro areas).

Defining “rural”: National Science and Technology Council (NSTC)

Administration

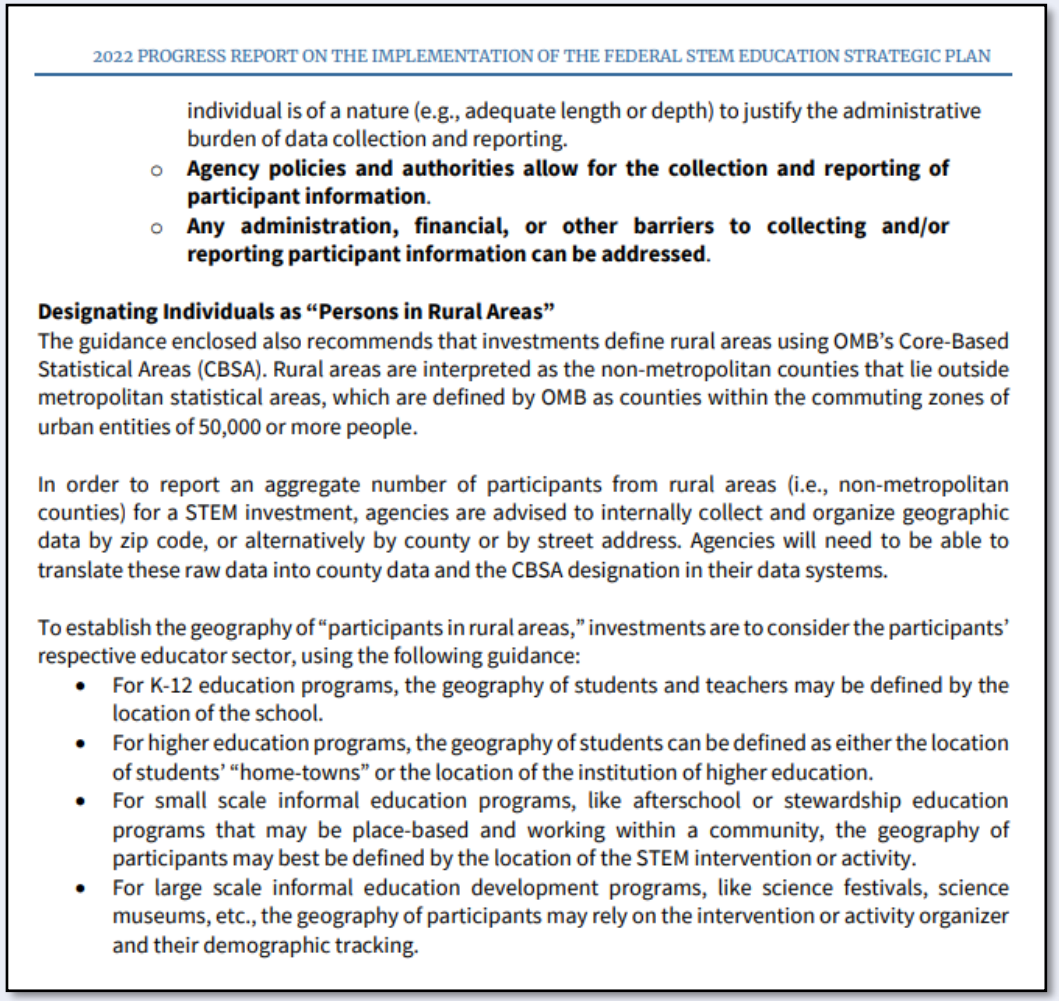
JANUARY 31, 2023

NSTC: 2022 Progress Report on the Implementation of the Federal STEM Education Strategic Plan

OSTP › NEWS & UPDATES › REPORTS AND DOCUMENTS

NSTC: *2022 Progress Report on the Implementation of the Federal STEM Education Strategic Plan* can be found here ↗.

https://www.whitehouse.gov/ostp/news-updates/2023/01/31/nstc-2022-progress-report-on-the-implementation-of-the-federal-stem-education-strategic-plan/



individual is of a nature (e.g., adequate length or depth) to justify the administrative burden of data collection and reporting.

- **Agency policies and authorities allow for the collection and reporting of participant information.**
- **Any administration, financial, or other barriers to collecting and/or reporting participant information can be addressed.**

Designating Individuals as “Persons in Rural Areas”

The guidance enclosed also recommends that investments define rural areas using OMB’s Core-Based Statistical Areas (CBSA). Rural areas are interpreted as the non-metropolitan counties that lie outside metropolitan statistical areas, which are defined by OMB as counties within the commuting zones of urban entities of 50,000 or more people.

In order to report an aggregate number of participants from rural areas (i.e., non-metropolitan counties) for a STEM investment, agencies are advised to internally collect and organize geographic data by zip code, or alternatively by county or by street address. Agencies will need to be able to translate these raw data into county data and the CBSA designation in their data systems.

To establish the geography of “participants in rural areas,” investments are to consider the participants’ respective educator sector, using the following guidance:

- For K-12 education programs, the geography of students and teachers may be defined by the location of the school.
- For higher education programs, the geography of students can be defined as either the location of students’ “home-towns” or the location of the institution of higher education.
- For small scale informal education programs, like afterschool or stewardship education programs that may be place-based and working within a community, the geography of participants may best be defined by the location of the STEM intervention or activity.
- For large scale informal education development programs, like science festivals, science museums, etc., the geography of participants may rely on the intervention or activity organizer and their demographic tracking.

Defining “rural”: National Science and Technology Council (NSTC)

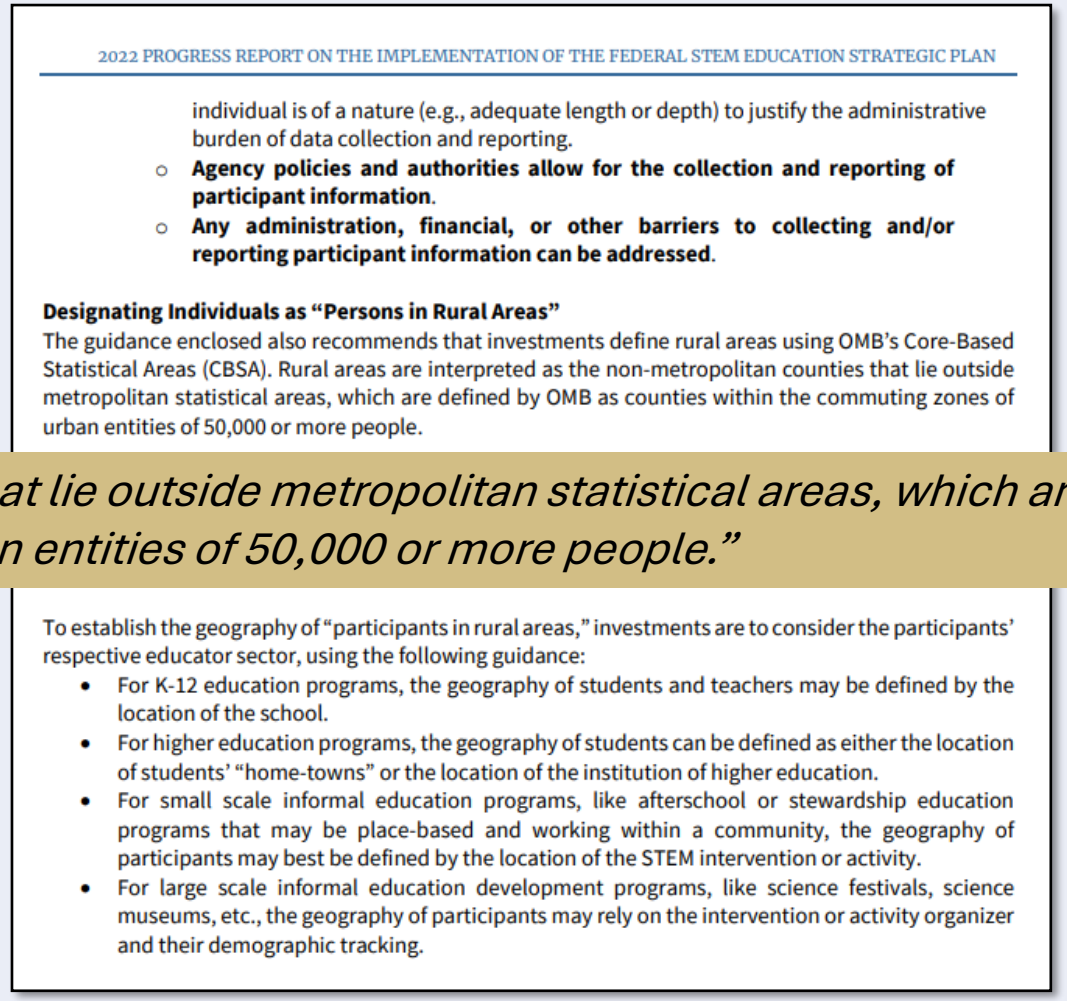
Administration

JANUARY 31, 2023

NSTC: 2022 Progress Report on the Implementation of the Federal STEM Education Strategic Plan

Education Strategic Plan can be found here ↗.

https://www.whitehouse.gov/ostp/news-updates/2023/01/31/nstc-2022-progress-report-on-the-implementation-of-the-federal-stem-education-strategic-plan/



individual is of a nature (e.g., adequate length or depth) to justify the administrative burden of data collection and reporting.

- **Agency policies and authorities allow for the collection and reporting of participant information.**
- **Any administration, financial, or other barriers to collecting and/or reporting participant information can be addressed.**

Designating Individuals as “Persons in Rural Areas”

The guidance enclosed also recommends that investments define rural areas using OMB’s Core-Based Statistical Areas (CBSA). Rural areas are interpreted as the non-metropolitan counties that lie outside metropolitan statistical areas, which are defined by OMB as counties within the commuting zones of urban entities of 50,000 or more people.

To establish the geography of “participants in rural areas,” investments are to consider the participants’ respective educator sector, using the following guidance:

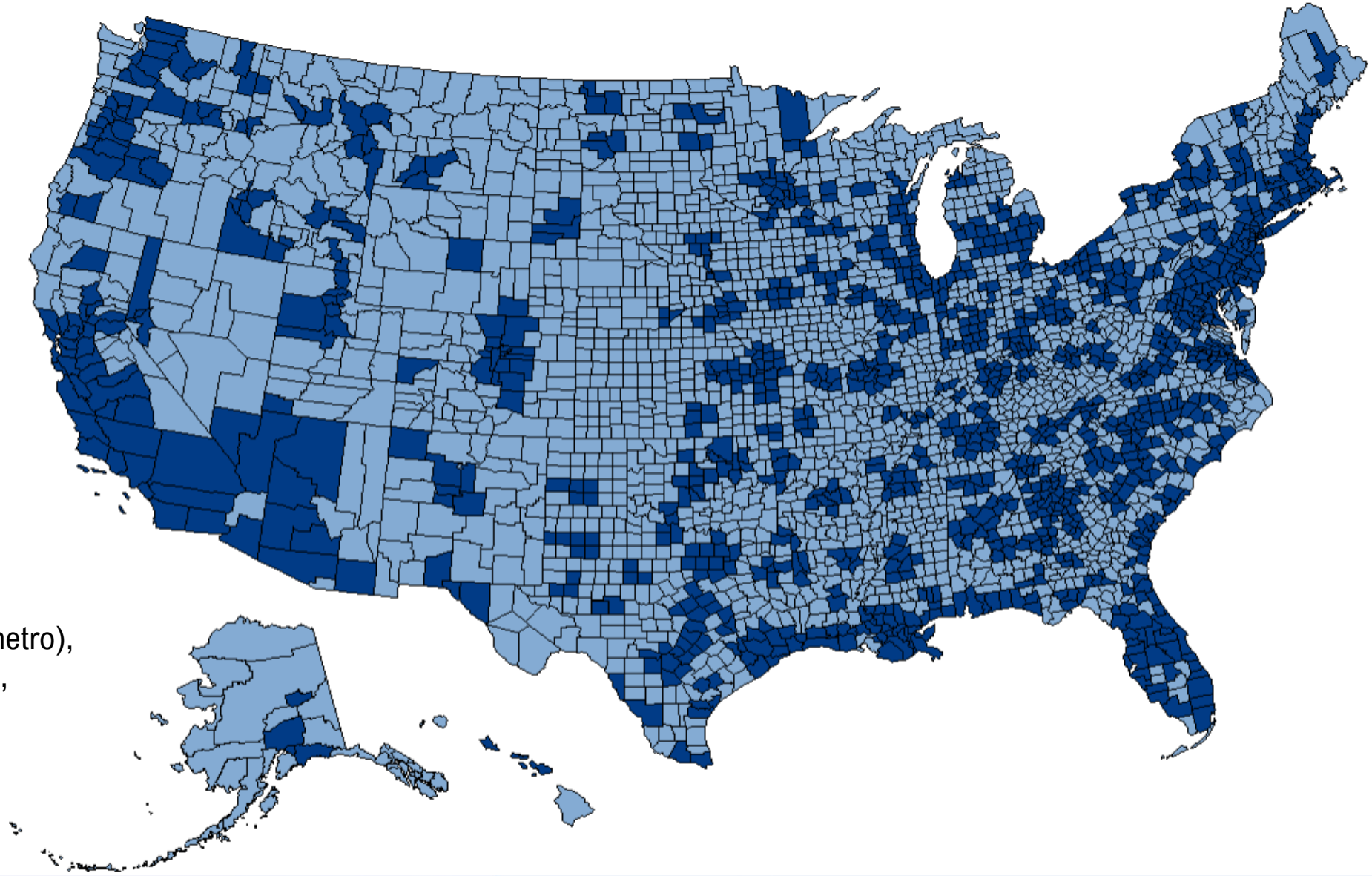
- For K-12 education programs, the geography of students and teachers may be defined by the location of the school.
- For higher education programs, the geography of students can be defined as either the location of students’ “home-towns” or the location of the institution of higher education.
- For small scale informal education programs, like afterschool or stewardship education programs that may be place-based and working within a community, the geography of participants may best be defined by the location of the STEM intervention or activity.
- For large scale informal education development programs, like science festivals, science museums, etc., the geography of participants may rely on the intervention or activity organizer and their demographic tracking.

“Rural areas are interpreted as the non-metropolitan counties that lie outside metropolitan statistical areas, which are defined by OMB as counties within the commuting zones of urban entities of 50,000 or more people.”

U.S. Counties

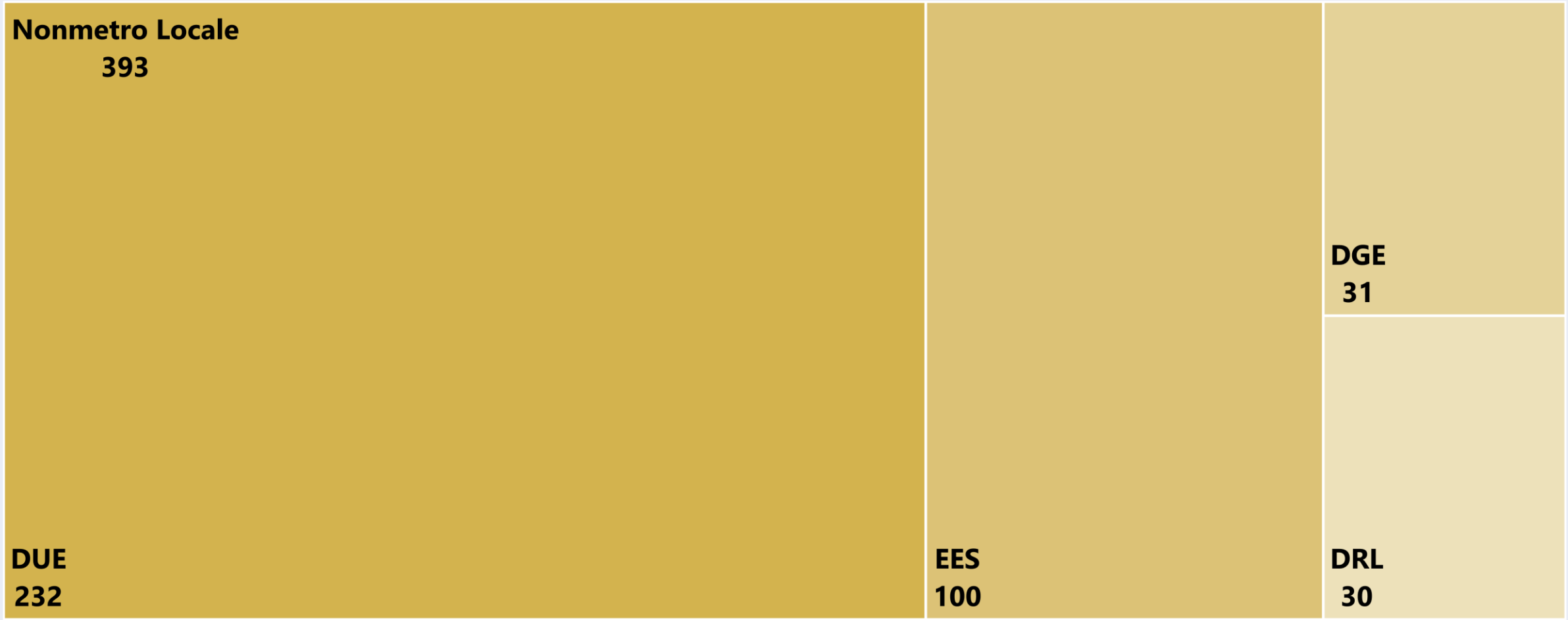
metro (~86%)

nonmetro (~14%)



Not Pictured:
Puerto Rico (~15% of counties nonmetro),
U.S. Virgin Islands (100% nonmetro),
American Samoa (100%),
Guam (100%) and Palau (100%)

Awards in Nonmetro Locale (interpreted as rural)

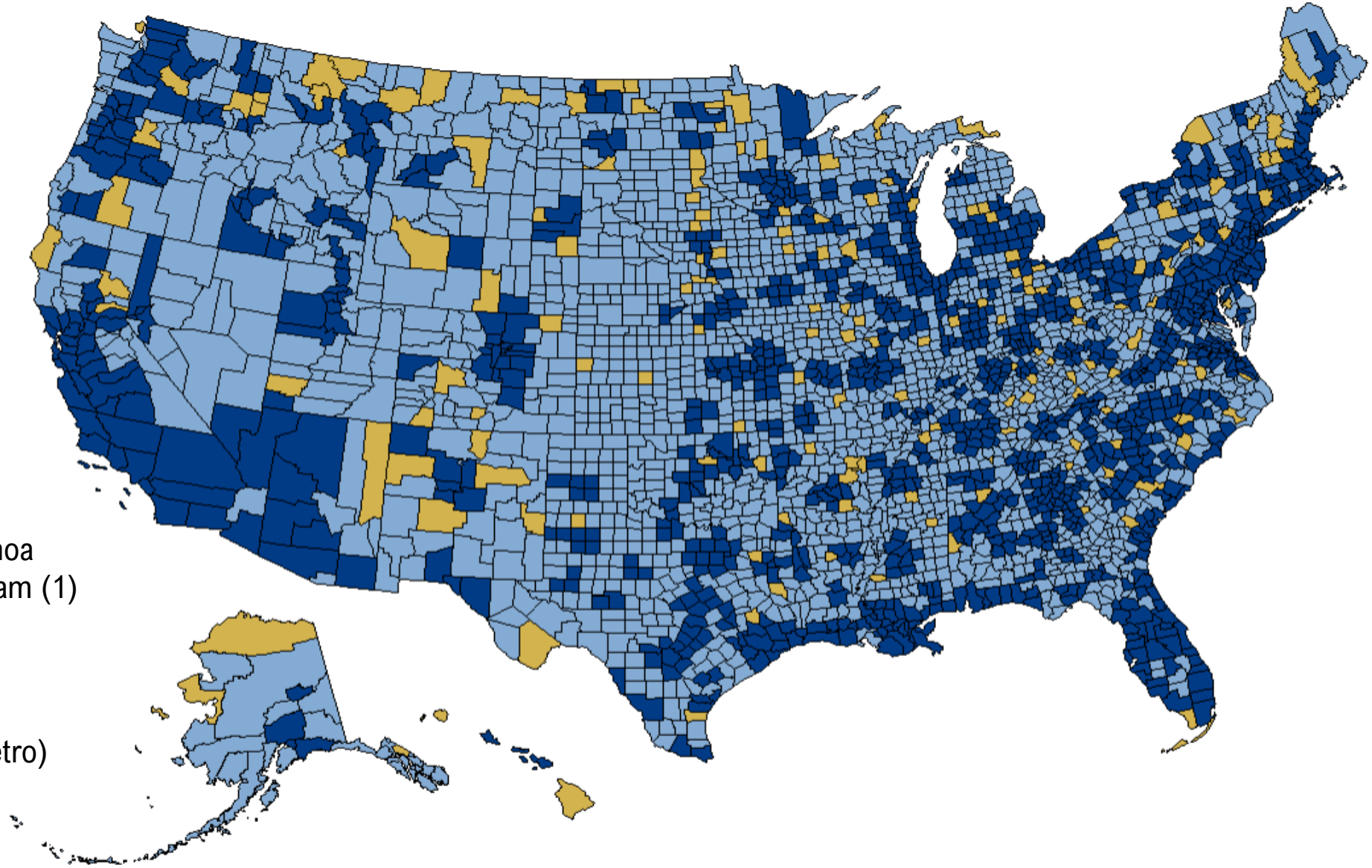


Active EDU Awards in Nonmetro Counties

metro

nonmetro

174 nonmetro counties with active EDU awards; not pictured: U.S. Virgin Islands (4 awards), American Samoa (1 award), Guam (1) and Palau (1)



Not Pictured:
Puerto Rico (~15% of counties nonmetro)

Investing in “rural”

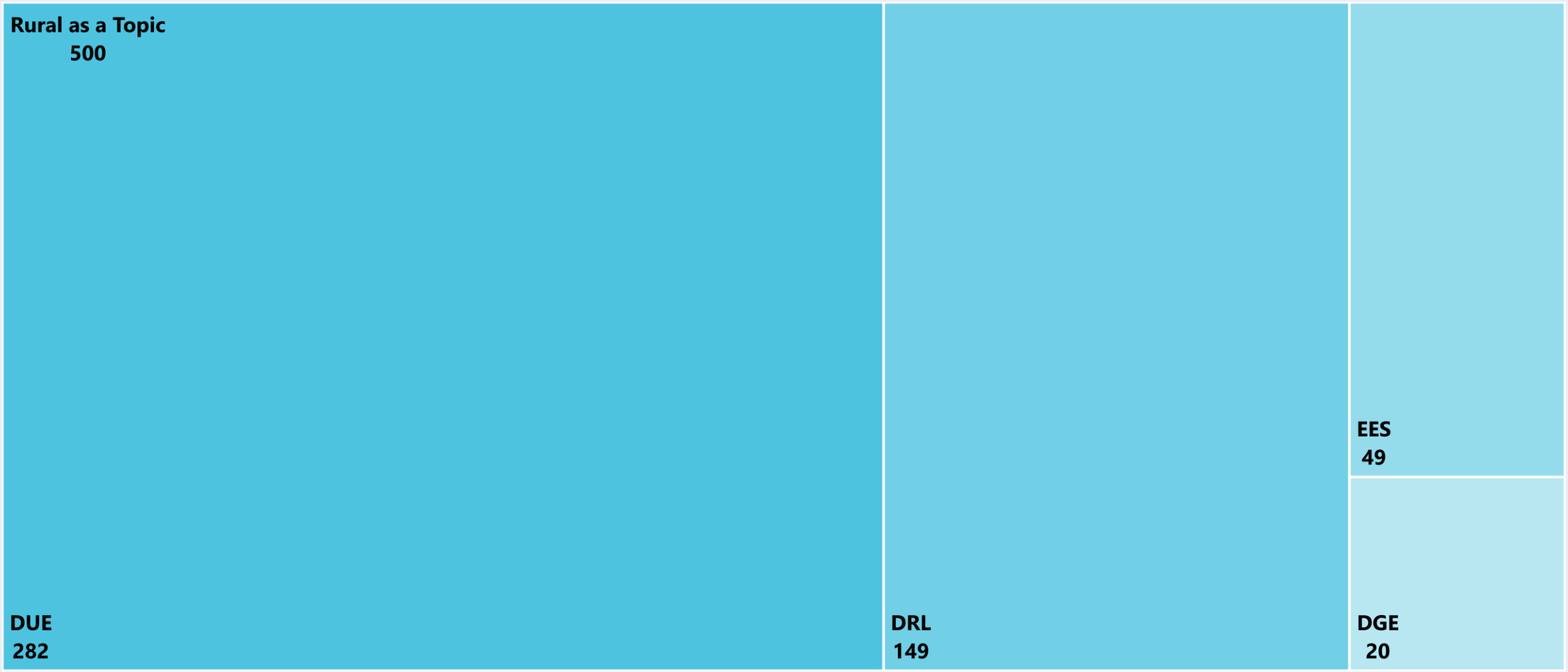
An award may be in a nonmetro locale, but an award (regardless of locale) also may be focused on specific populations or contexts, for example:

- Rural population
- Rural context
- Focus on recruitment of rural participants
- Educational intervention for learners in rural locales
- Partnership among rural and urban institutions
- Pre- or In-Service teacher experiences in rural classrooms
- Wraparound support for learners from rural locales at urban institutions

In other words, investments with **Rural as a Topic** of interest.

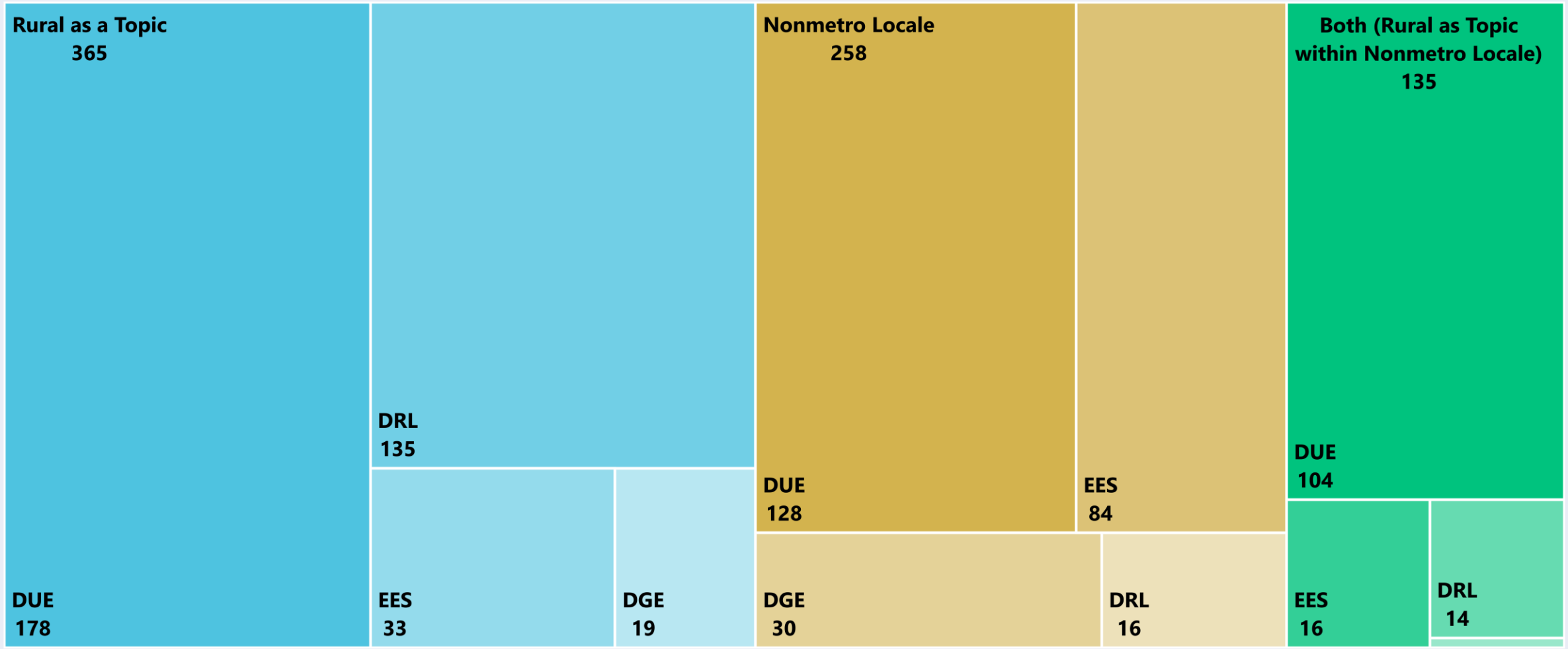
Awards with Rural as a Topic of interest

All data as of May 1, 2024.



NSF's Directorate for STEM Education has 758 active awards on rural topics, in nonmetro locales, or in both.

All data as of May 1, 2024.



Metro vs. Nonmetro

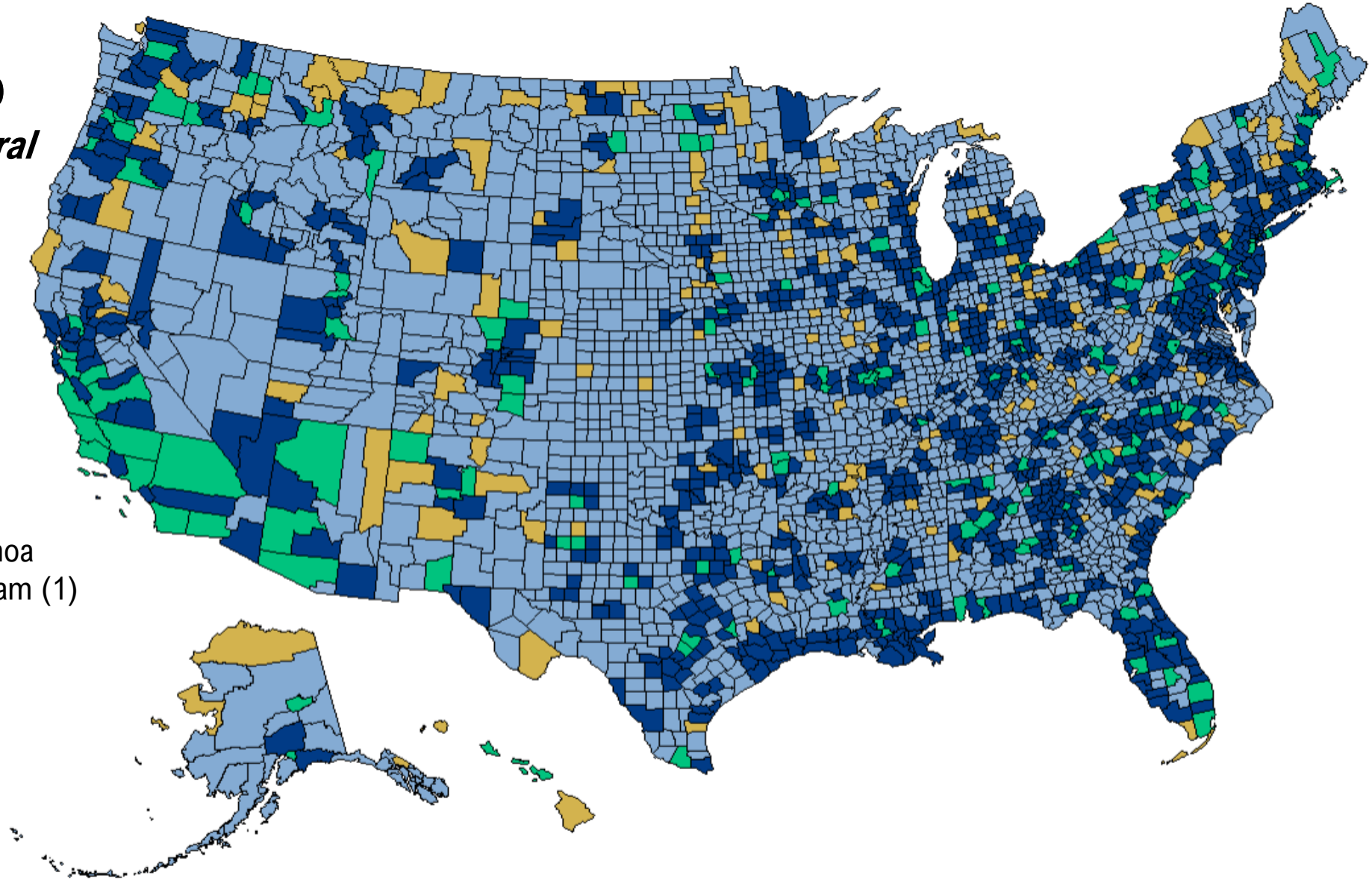
Active EDU investments in rural

metro

nonmetro

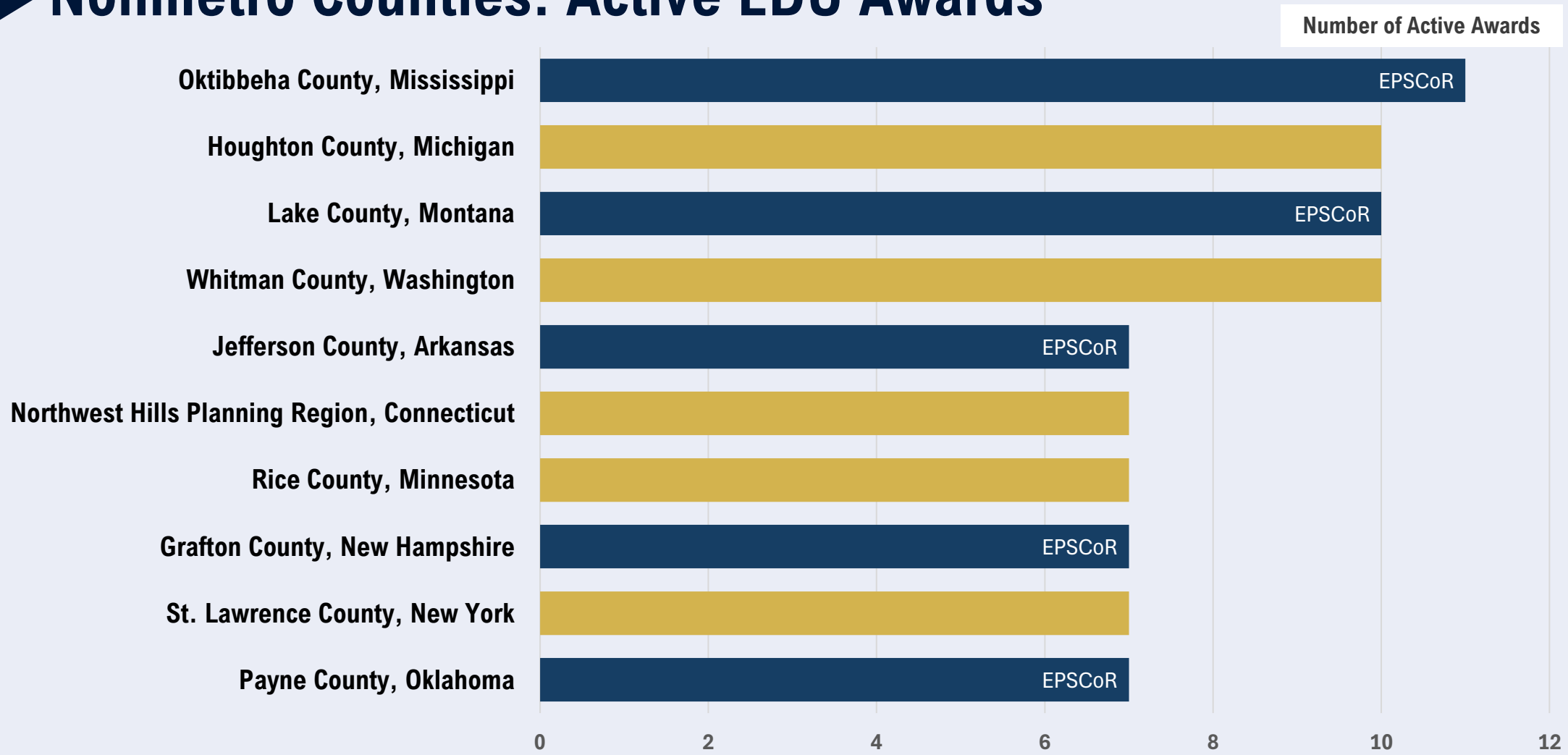
185 metro counties with active EDU awards focused on rural as a topic; not pictured: Puerto Rico (1 award)

174 nonmetro counties with active EDU awards; not pictured: U.S. Virgin Islands (4 awards), American Samoa (1 award), Guam (1) and Palau (1)

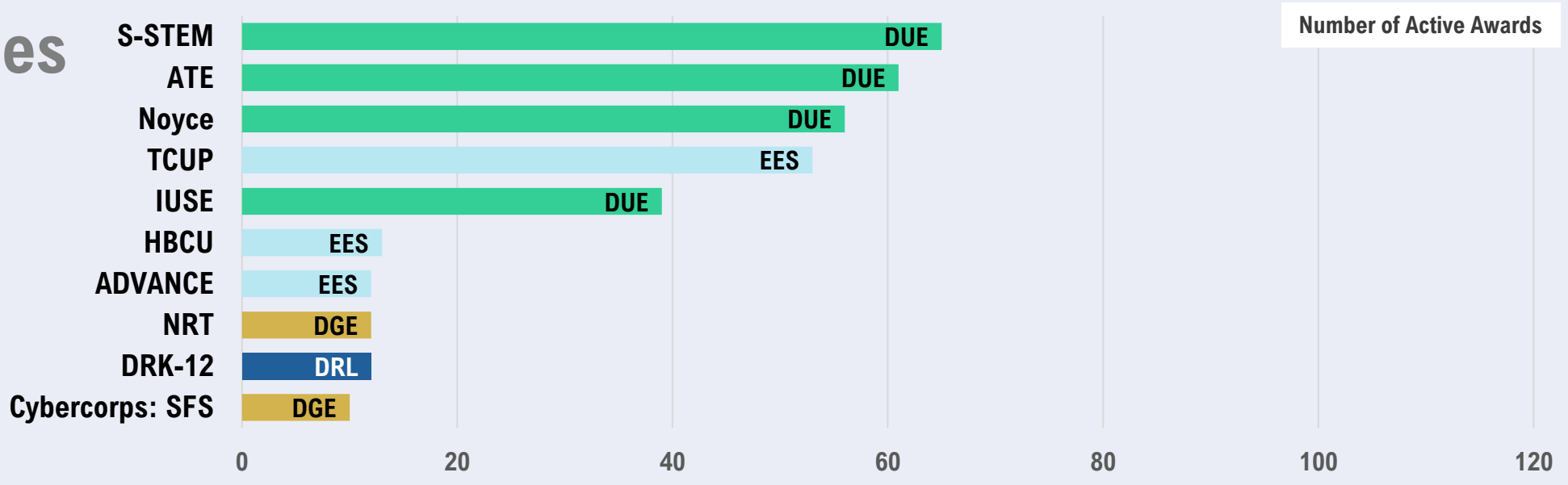


Top 10

Nonmetro Counties: Active EDU Awards

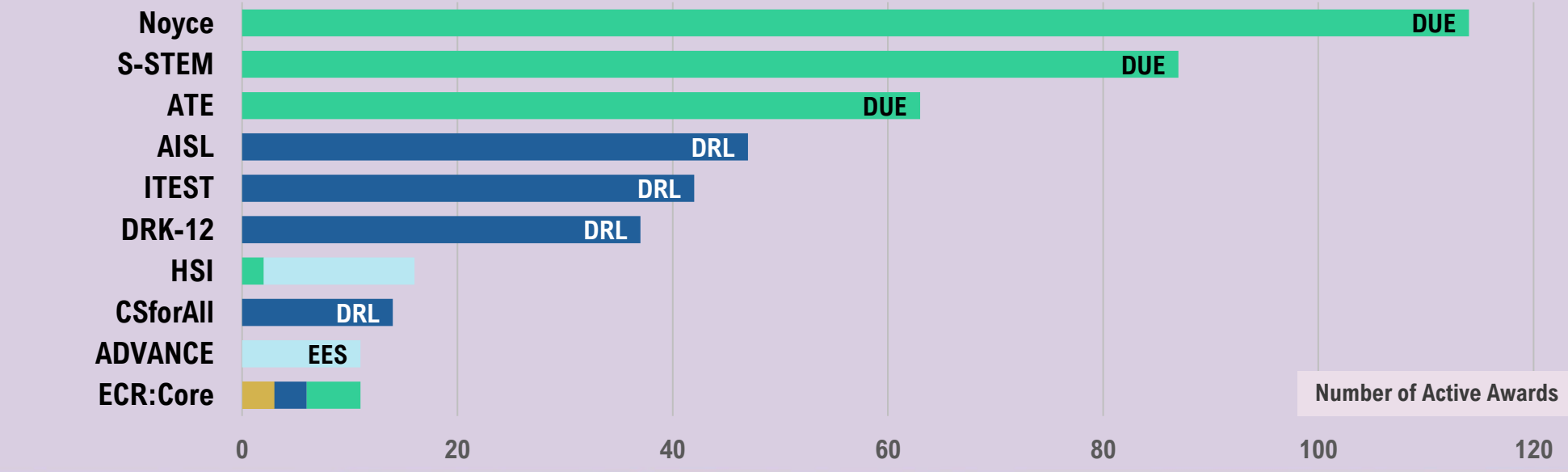


Nonmetro Locales



Top 10

Rural Topics



Session 1 Discussion Questions

1. When you think of Unleashing STEM Education and Workforce Opportunities, what comes to mind?

2. What does success in this space look like?

3. When we get to the end of our Advisory Committee Meeting tomorrow, what are some signs that would indicate your time was well spent?

BREAK 11:45 a.m. – 12:00 noon

SESSION 2: Voices from the Field – The Impact of EDU Investments

Moderator: Dr. Roz Hobson Hargraves

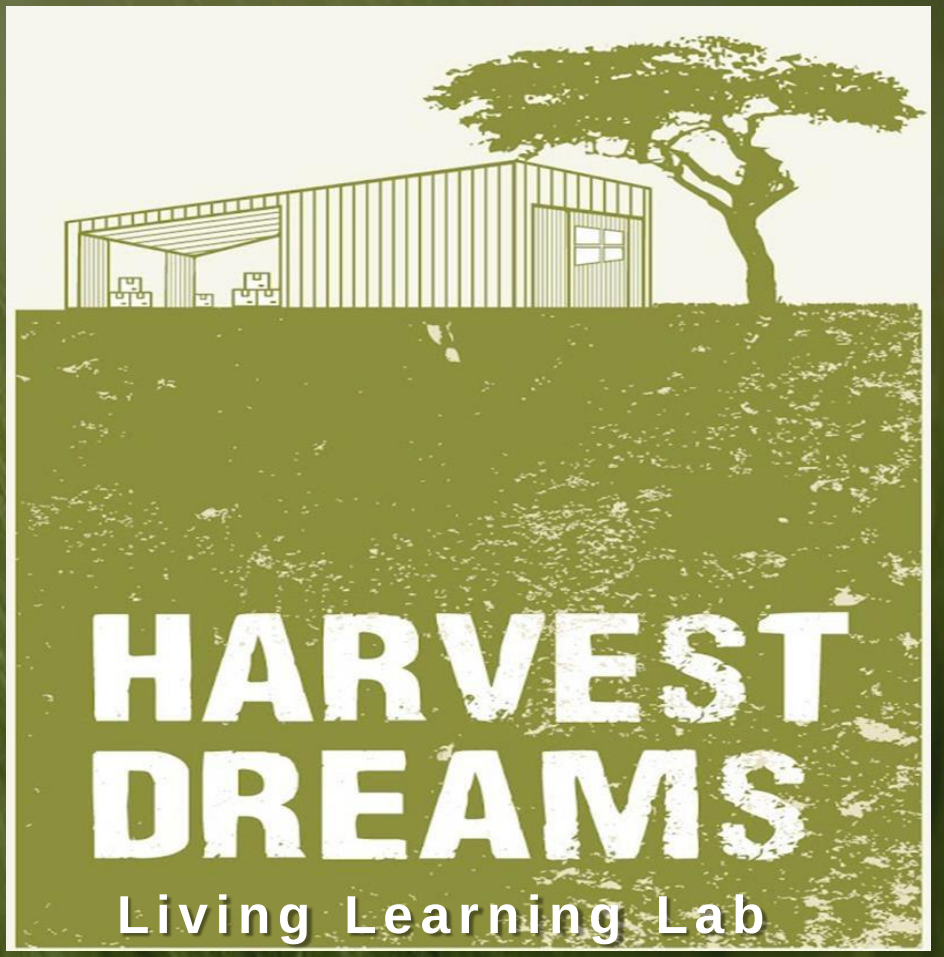
National Science Foundation's Directorate for STEM Education's Advisory Committee (EDU AC) Session 2

May 29, 2024
12:00 - 1:00pm EST

STEM Field of Impact:
NSF Project Number: 2142149

Voices From the Field:
The Impact on EDU Investments

Division of Undergraduate Education

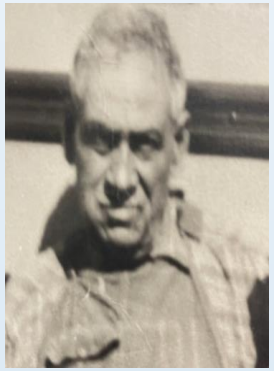


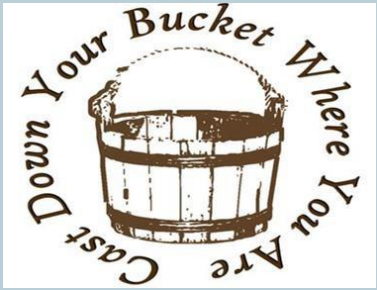
Visionary Presenters:
Robertha "RoMadre" Richardson
Deborah Richardson
PowerPoint Creator – Jerri Glass

THE SEVENTH GENERATION PRINCIPAL

MY PERSONAL EXPERIENCES IN RURAL AMERICAN STEM EDUCATION:

NEW MEXICO
RURAL ALABAMA BLACK BELT
(MACON COUNTY-LITTLE TEXAS RURAL COMMUNITY)





HARVEST DREAMS
LIVING LEARNING LAB

Opportunities:
How has participating in this project helped Harvest Dreams Living Learning Lab?

Success Stories:
What worked for
Harvest Dreams Living Learning Lab?

Challenges:
What did not work for
Harvest Dreams Living Learning Lab?

"The creative arts experience of painting, sculpting, designing, and decorating the sacred haven of Harvest Dreams"

"Brought from textbook to real-time observation and implementation".

- Capital investments (e.g.) Infrastructure *Showcase*

Workshops and Demonstrations

Harvest Dreams Living Learning Lab Program Impact to Rural STEM Education The Principles of: Reuse, Recycle, Repurpose, Natural Building Materials and Living in Harmony with Mother Nature

Teamwork

Critical Thinking

Communication

Cultural Empathy

Problem Solving

Community Transformation

Jack Pakkebier

- Kansas State University master's student and NRT trainee in rural resource resiliency
- Field of study: Mechanical engineering with a focus on solving issues in the food, energy, and water (FEW) nexus
- NSF project number: 1828571

- Raised on a farm outside of Phillipsburg, Kansas
  - Population ~ 2200
- My research through NRT can directly impact rural Kansas
- Funded by NRT for 1 year
  - Water retention
- Currently funded by DOE
  - Maintain agricultural connection

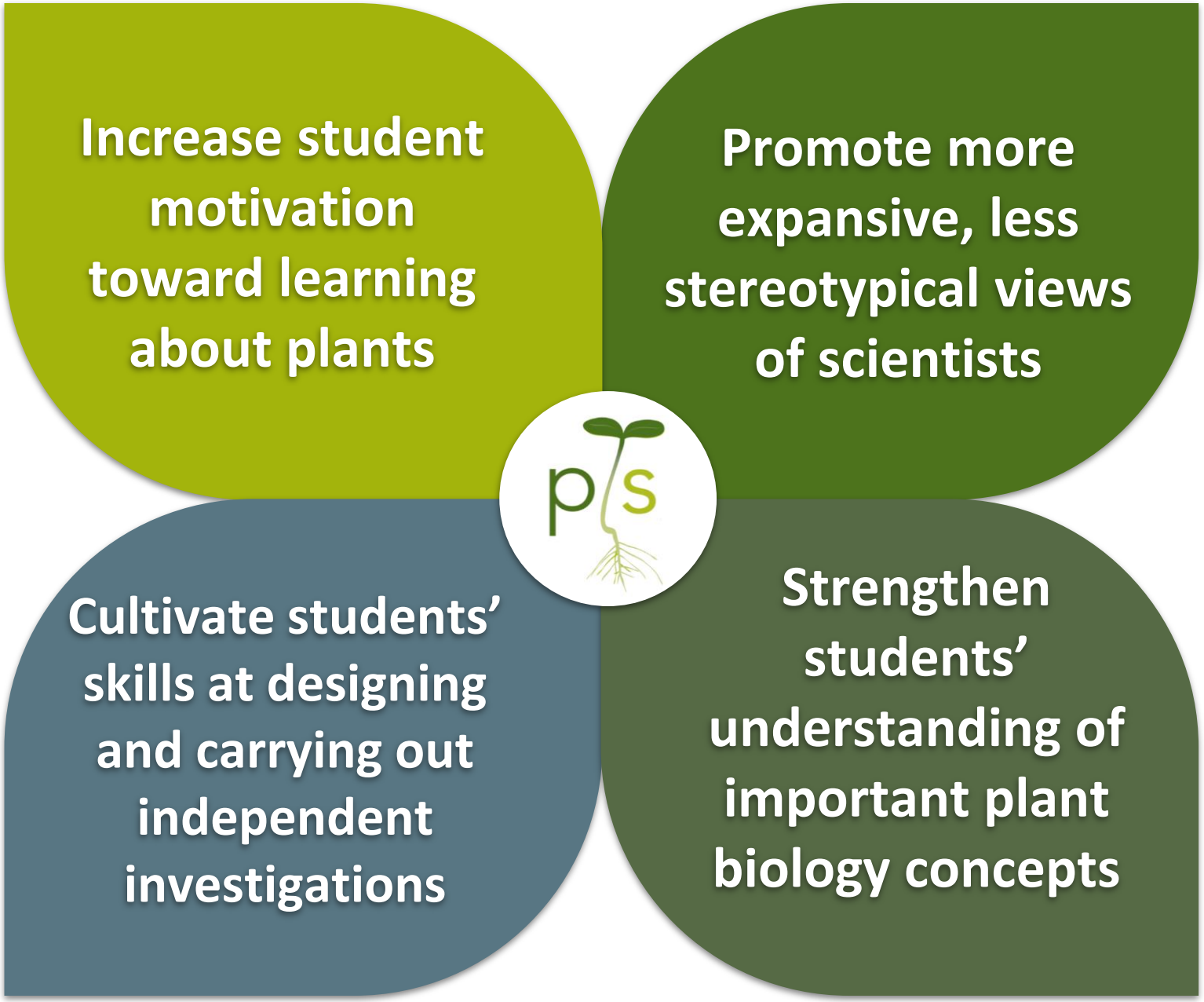
- My education through NRT has had a strong interdisciplinary aspect
  - Classwork
  - Research

- Day trip to southwest KS
  - Dairy
  - Farm/Ranch
  - Wastewater treatment plant

PlantingScience

Mary Eldredge Sandbo, Ed.D., NBCT
Biology Teacher at Des Lacs-Burlington High School
Des Lacs, North Dakota

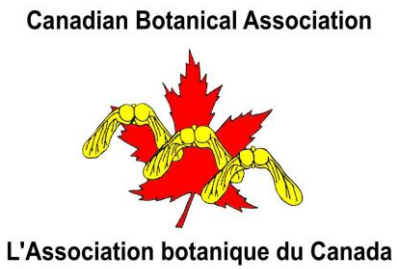
Purpose of the Program



real plants real science real scientists

planting science

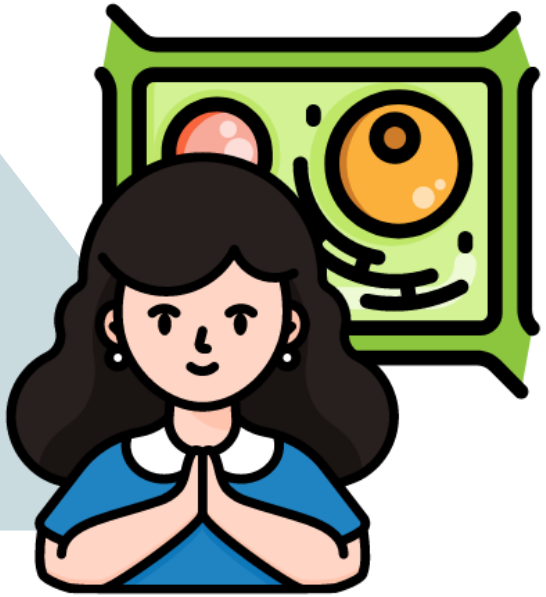
A student-teacher-scientist partnership
promoting plant-based learning
in 6-12+ grade classrooms



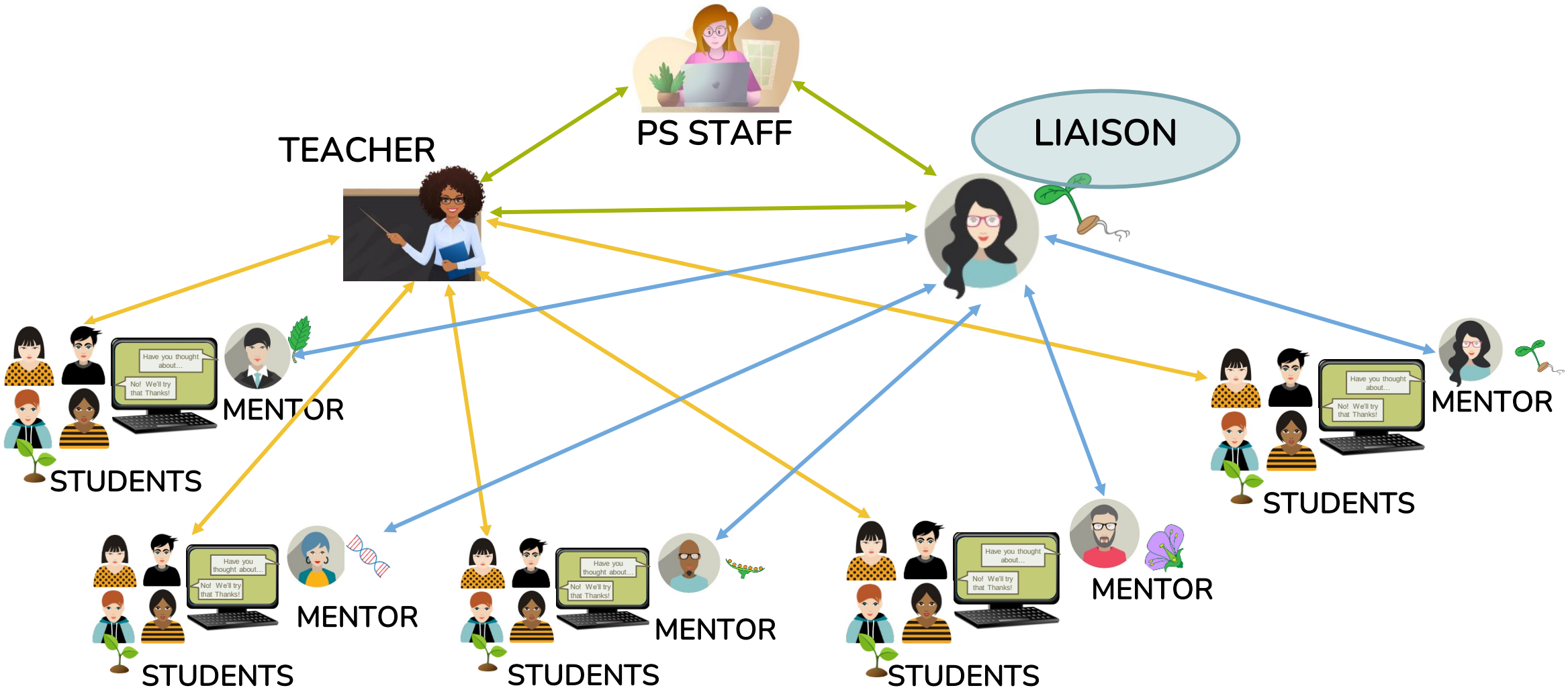
PlantingScience is an

STSP

Student-Teacher-Scientist Partnership



The PlantingScience Network



PlantingScience and Rural Schools

- Since 2005, 94 rural schools have used PlantingScience with their students, many for multiple sessions.
- More than 800 projects completed by students.
- Most popular topics include seed germination, photosynthesis, and food production.

Questions?

Contact psteam@plantingscience.org

Also see the September 2023 online article in American Biology Teacher
https://nabt.org/files/galleries/ABT_Online_Sept_2023.pdf

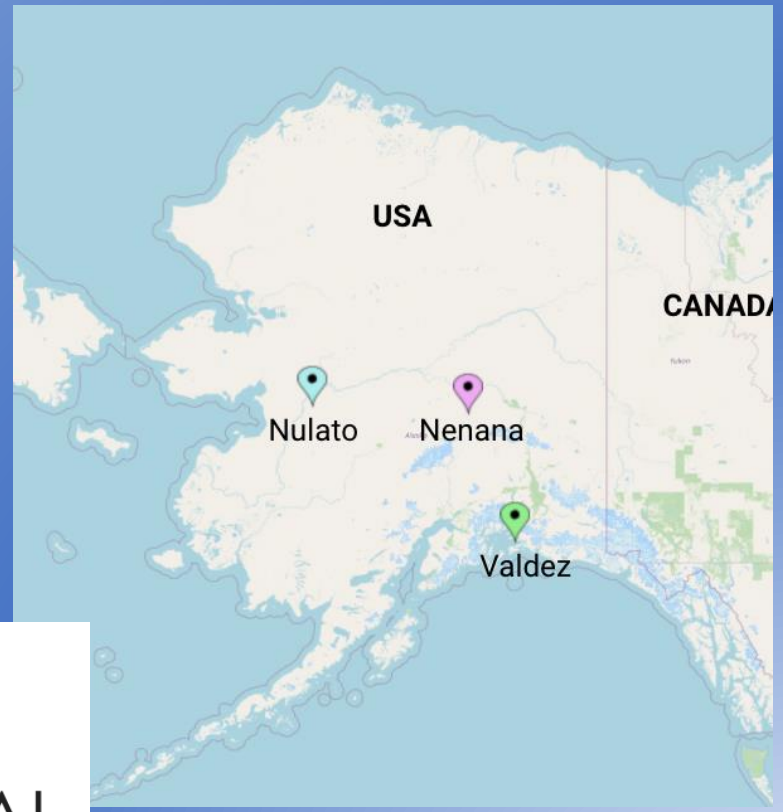
DRONES:
Drone Research and Opportunities for Native Elementary Students

Mariah McNamara & Don Charlie
University of Alaska Fairbanks

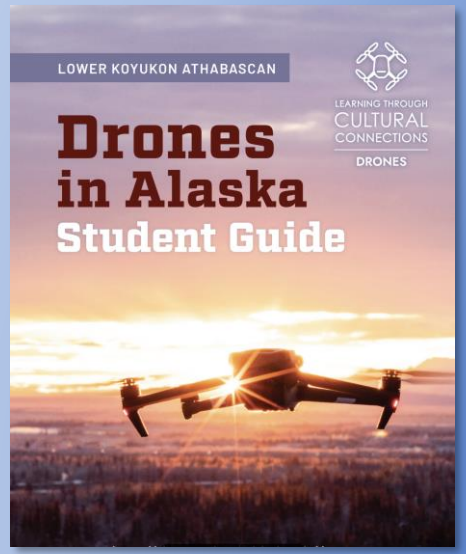
This material is based upon work supported by the National Science Foundation under Grant No. 1850561 & 1850556..
Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.
UA is an affirmative action/equal opportunity employer, educational institution and provider and prohibits illegal discrimination against any individual: www.alaska.edu/nondiscrimination.

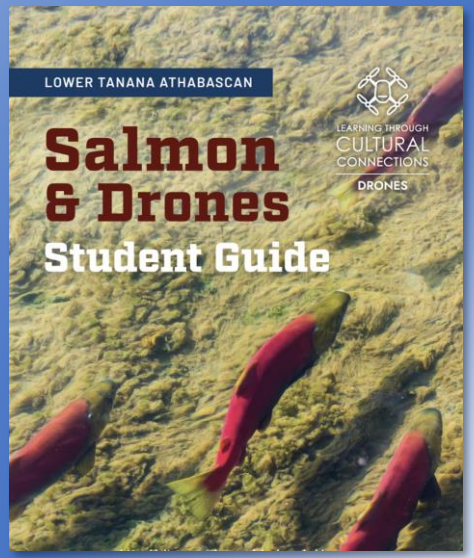
Drone Research and Opportunities for Native Elementary Students

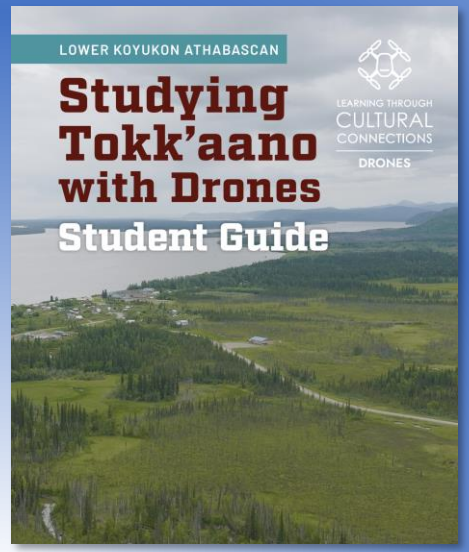
- NSF grant funded in 2019 *(#1850561 & 1850556)*
- Partner communities: Nulato, Nenana, Valdez
- 4th-6th grade curriculum
- ***Deliverables:*** 4 place-based drone student guides, associated teacher lesson plans, place-based videos, career expo guide, teacher PD course
  - Nulato: Erosion
    Nenana: Salmon
    Valdez: Habitat Restoration

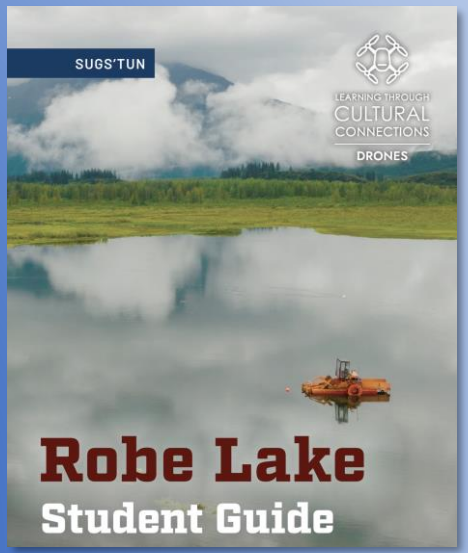


CULTURAL CONNECTIONS
Drones


LOWER KOYUKON ATHABASCAN
Drones
in Alaska
Student Guide
LEARNING THROUGH
CULTURAL
CONNECTIONS
DRONES


LOWER TANANA ATHABASCAN
Salmon
& Drones
Student Guide
LEARNING THROUGH
CULTURAL
CONNECTIONS
DRONES


LOWER KOYUKON ATHABASCAN
Studying
Tokk'aano
with Drones
Student Guide
LEARNING THROUGH
CULTURAL
CONNECTIONS
DRONES


SUGS'TUN
LEARNING THROUGH
CULTURAL
CONNECTIONS
DRONES
Robe Lake
Student Guide

National Science Foundation (NSF)
Directorate for STEM Education (EDU)
Advisory Committee Meeting

Voices from the Field – The Impact of EDU Investments

Presented by: Jonathan Townes

Date: May 29, 2024

About the Presenter

- **Name:** Jonathan Townes
- **Place of Employment:** Hinds Community College
- **Role:** Vice President - Career and Technical Education, Sponsored Grants, and HBCU Initiatives
- **Alumnus:** Jackson State University and Mississippi College
- **Philosophy:** *Whatever the mind can conceive and believe, the mind can achieve.*
    - *--Dr. Napoleon Hill*

STEMulating the “M” in STEM (Award 2107520)

- **The overarching goal of the project:**

  - Recruit, prepare, develop, and retain African-American students at-risk for failure in math courses.

  - Increase interest in STEM by providing academic support during their matriculation from one critical transition (high school to 2-year institution) to the next through innovative teaching and learning strategies.

STEMulating the “M” in STEM (Award 2107520)

Objectives:

- **Objective 1:** To increase the math scores of high school students on state/ACT/Next Generation ACCUPLACER assessments
- **Objective 2:** To increase the success rates of students taking developmental/college level math courses through academic supports
- **Objective 3:** Strengthen the Math infrastructure at HCC - UTC to increase students’ persistence in STEM

Institutional Impact and Partnerships

- Campus math tutorials and math labs
- ACT workshops
- Title III and TRIO program partnerships
  - Upward Bound
  - Upward Bound Math and Science
  - Talent Search
  - Student Support Services
- Campus recruitment and retention

Acknowledgements

- I would like to take time to acknowledge the entire NSF team. The Directorate of EDU, directorate and division leadership, program officers, and program staff.

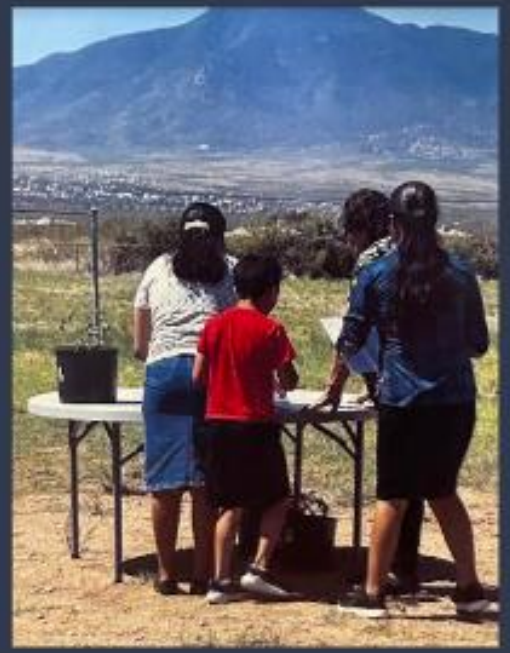
Thank you!

Contact

Email: Joanthan.Townes@hindscc.edu

Phone: 601-885-7001

Voices from the Field



Borderlands Education Center

Blais Cross

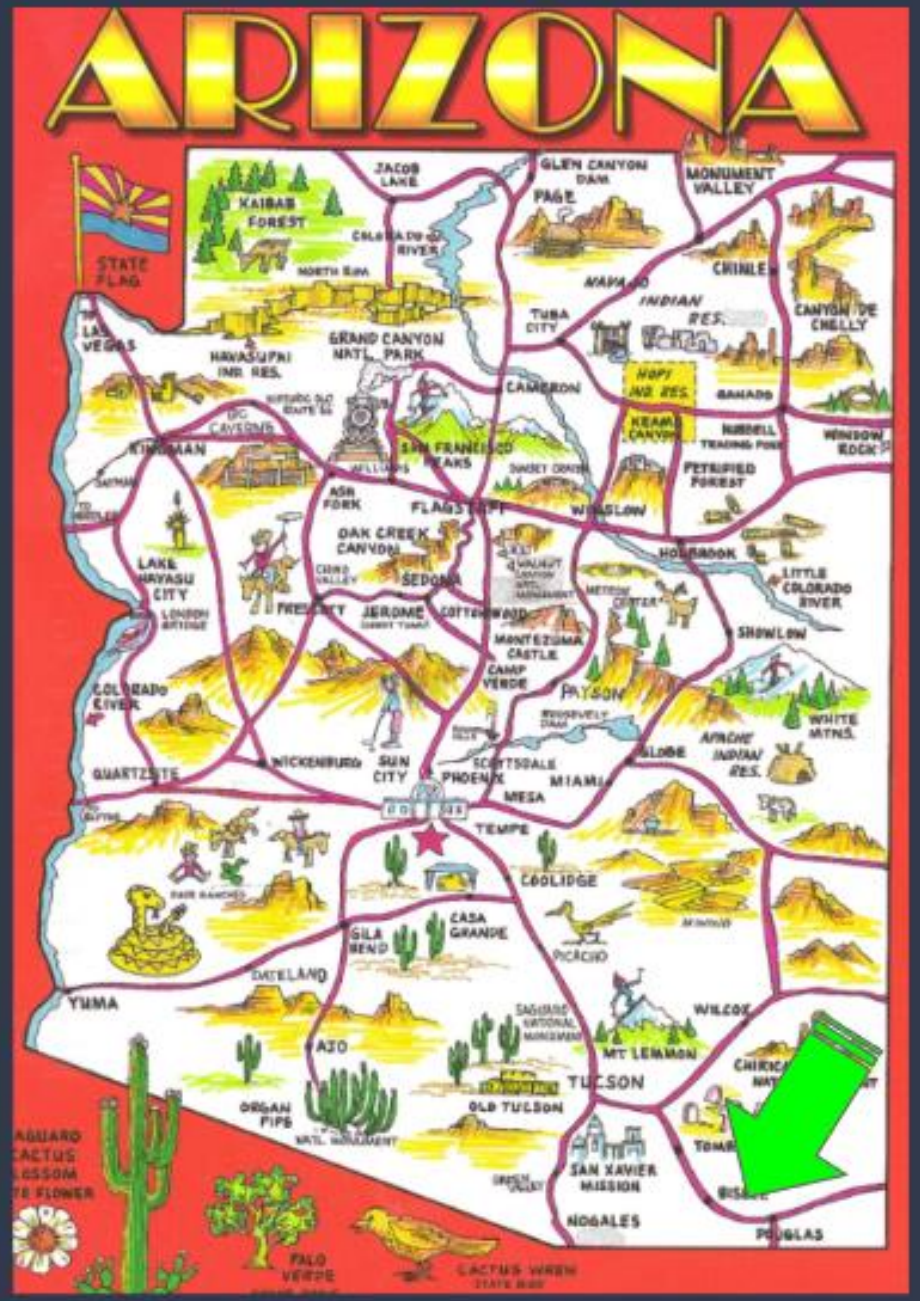
Bisbee High School Math Teacher

University of Arizona Noyce Borderland Master Teacher Fellowship, NSF #1950129

Essential Question:

What are some classroom goals that are significant to you?

- Explore and facilitate project based research activities for the math classroom that amplify student voice, creativity, and engagement
- Build equitable math learning spaces with the implementation of data science activities that incorporate technology and social justice topics
- Promote and empower students to nurture their analytical identities by promoting data literacy, a growth mindset toward problem solving and critical thinking



SAN FRANCISCO STATE UNIVERSITY

Some Key Features of Teaching for Justice

1. Student agency: Students are involved in design and decision
2. Learning new skills: Students are developing new skills that they will be able to retain and apply in other circumstances.
3. Promoting Identity: Students are able to learn more about themselves, their heritage, and their contributions.
4. Promoting Diversity: Learning and recognitions of the experiences and assets of others.
5. Recognizes importance of life: Students engage in project that they believe will positively impact the state of life (humans, animals, plants)
6. Actionable: Students are able to see how the work they are doing can be put into action to make change.

NCTM 2023 Annual Meeting & Exposition in Washington, DC

Features of Social Justice Math

Motivation

Investigation

Reflection

Action

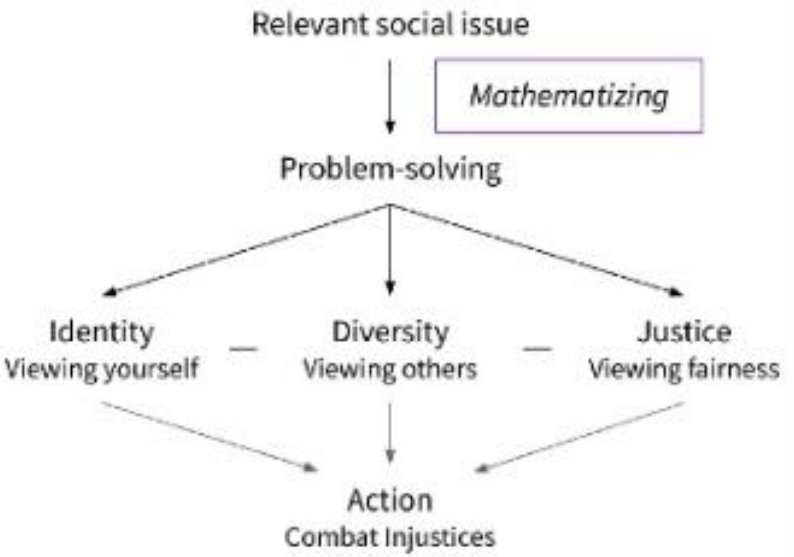
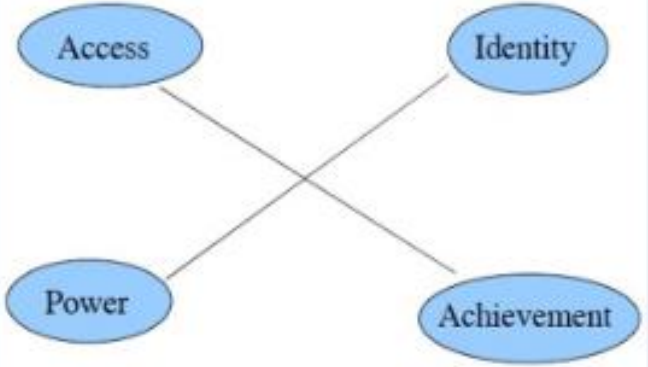


Figure 1.1. Equity-driven mathematics teaching frameworks—a nested relationship (Picha, 2019).

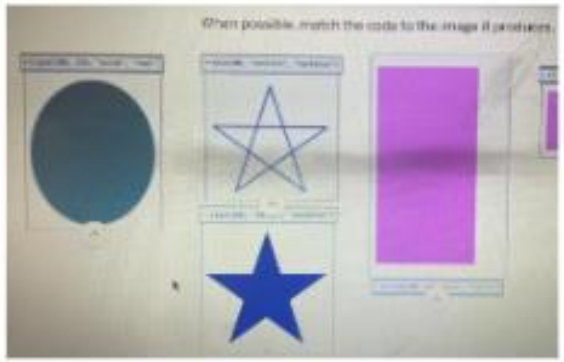
Chicago, Illinois September 25-28, 2024

Dimensions of Equity



University of Arizona: Data Science Fellowship

Data Science Needs All Voices



THE UNIVERSITY OF ARIZONA
OFFICE OF THE PROVOST
Data Sciences Academy

@BootstrapWorld

DIMENSIONS OF EQUITY

As equity-focused educators, it is important to distinguish between three key areas in education: *multicultural education*, *social justice education*, and *culturally responsive teaching*. Too often the terms are used interchangeably when they are not. Below is a simple chart to help you understand the distinctions between them. A key point to remember, only CRT is focused on the cognitive development of under-served students. Multicultural and social justice education have more of a supporting role in culturally responsive teaching.

MULTICULTURAL EDUCATION	SOCIAL JUSTICE EDUCATION	CULTURALLY RESPONSIVE PEDAGOGY
Focuses on celebrating diversity	Focuses on exposing the social political context that students experience	Focuses on improving the learning capacity of diverse students who have been marginalized educationally
Centers around creating positive social interactions across difference	Centers around raising students' consciousness about inequity in everyday social, environmental, economic, and political aspects of life	Centers around the affective & cognitive aspects of teaching and learning
Concerns itself with exposing privileged students to diverse literature, multiple perspectives, and inclusion in the curriculum as well as help students of color see themselves reflected.	Concerns itself with creating lenses to recognize and interrupt inequitable patterns and practices in society.	Concerns itself with building resilience and academic mindset by pushing back on dominant narratives about people of color.
Social Harmony	**Critical Consciousness**	**Independent Learning**

Copyright © 2017 Zaretta Hammond. All Rights Reserved

Bisbee High School Breakfast Survey Class of 2024

1) How many times did you eat breakfast at school this week?

2) Indicate the level that you agree or disagree about the following statement: **I have access to school breakfast.** *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

3) Indicate the level that you agree or disagree about the following statement: **The cost of food offered at school is affordable.** *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

4) Indicate the level that you agree or disagree about the following statement: **I am satisfied with the current breakfast schedule.** *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

5) Indicate the level that you agree or disagree about the following statement: **I am satisfied with the quality of food served in the cafeteria.** *

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

6) What motivates you to eat breakfast at school? *

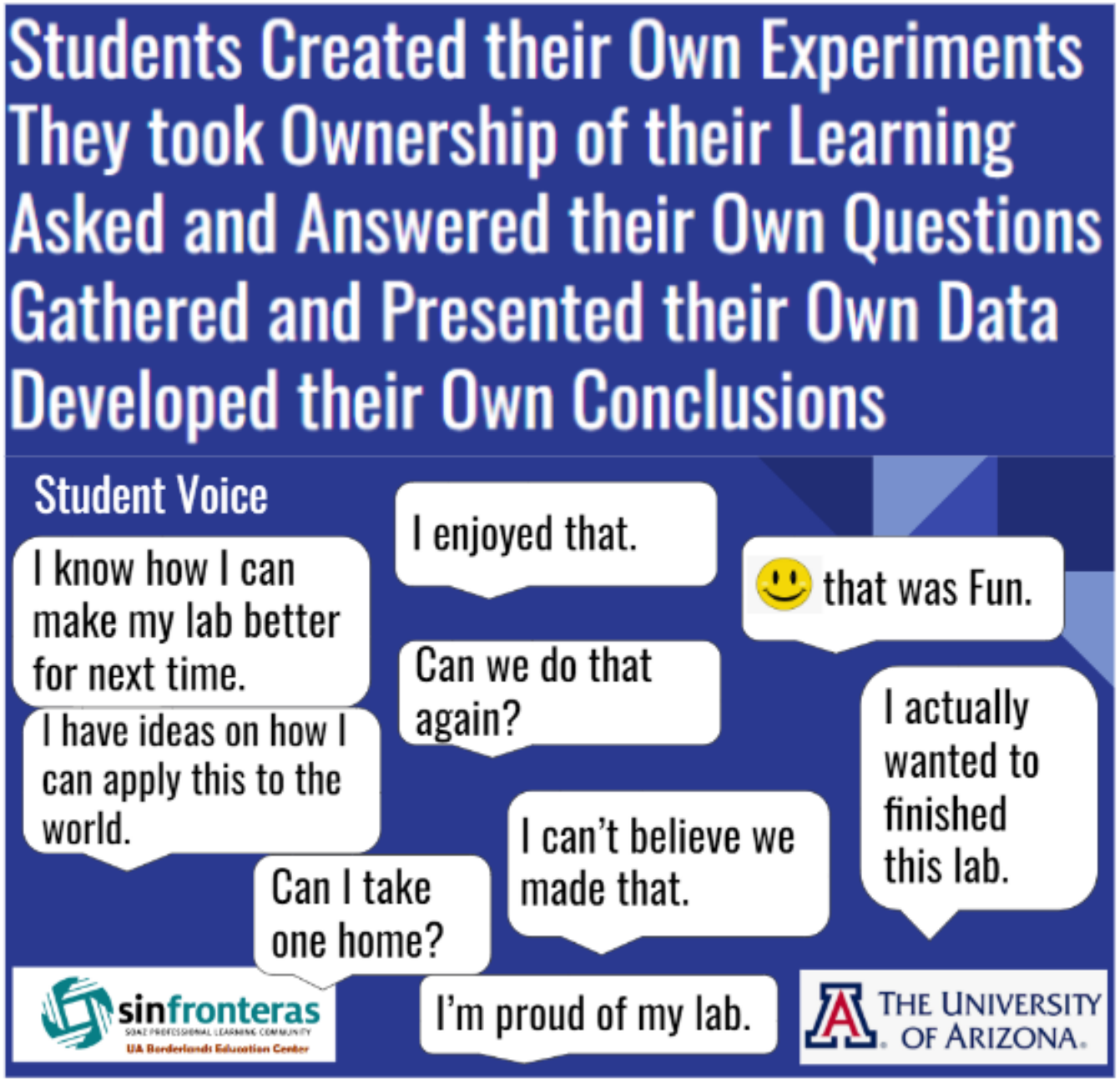
Bisbee Unified School District Board Meeting held on 12/12/23
Student Presenters with Cafeteria Staff

HERALD/REVIEW
Published Friday, 12/15/23

Bisbee High students survey on breakfast

Nothing is worse than providing food for breakfast only to have it tossed in the garbage, or to expect to get something to eat at the start of the school day,but find the cafeteria closed when buses run late. The bus that picks up students in Naco, Arizona, can have problems arriving on time.

BHS students want the cafeteria to offer breakfast a little later in the morning to avoid losing out. Others want it later so they can shake off the midmorning hunger pangs. Some may take items like fresh fruit or packaged snacks to put in their backpacks for later.



Student Feedback:

As a member of Ms. Cross's CoStats class, I found this project to be very inspiring. For one of the first times in my life I watched my classmates genuinely want to engage in the discussions, share their theories, and play their part. I could tell that the majority was passionate about making some changes. Even students that generally choose not to engage in academics were into it, and even showed up to speak to the school board.

sinfronteras
SOAZ PROFESSIONAL LEARNING COMMUNITY
UA Borderlands Education Center

Noyce Borderlands
Master Teacher Fellow

Blais Cross

In association with Sin Fronteras: SOAZ Professional Learning Community Project

Borderlands Education Center
THE UNIVERSITY OF ARIZONA COLLEGE OF SCIENCE Biosphere 2
COCHISE COLLEGE
UNIVERSITY SOUTH FOUNDATION

This material is based upon work supported by the National Science Foundation under Grant # 1557396. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

Session 2 Discussion Questions

1. What caught your attention from the Voices in the Field, and why?

2. Did you notice any common themes in their mini-presentations?

3. How can EDU better capture and communicate this impact?

BREAK 1:40 – 1:55 p.m.

SESSION 3: Principal Investigators Panel – Rural STEM Education and Workforce Development

Moderator: Dr. Luis Cubano

Dr. Cherise Harrington
Dr. Justin McDaniel
Dr. Amanda Bastoni
Dr. Dana Franz
Dr. Sue Ann Heatherly

PROSTEM:
Promoting Rural Opportunities in STEM

Principal Investigator: Cherise Harrington, PhD, MPH (NCCU)
Co-Investigators: Dr. Gail Hollowell
Dr. Jonathan Livingston
Dr. Donna Grant (retired)

NC Central University

PROSTEM
Promoting Rural Opportunities in STEM

OVERVIEW

PRO-STEM, an exploratory project designed to investigate the key contributors, barriers, and challenges to choosing STEM course-work and degrees for rural, low income, and/or people of color.

This project used a community-based perspective and includes a mixed-method approach.

These results are designed to gain an understanding of the contributing factors related to STEM-based educational attainment in rural students of color.

- Phase 1 was to conduct key formative work to identify the barriers and resources to inform the development of engagement strategies for rural students to enter and remain in the STEM-educational pipeline.

- Phase 2 is to conduct a small pilot study to determine the feasibility and assess preliminary efficacy for a program designed to recruit students in STEM-based degrees (Program GO STEM [Gaining Opportunities in STEM]).
  - Program GO STEM a program is informed by a community advisory board and the students themselves, based on socioecological framework and includes education, enrichment activities, social support, and technology.

RESEARCH ACTIVITIES

STRUCTURED INTERVIEWS (N=15)	FOCUS GROUPS/LISTENING SESSIONS (N=~200)	SURVEYS (N=306)	PROTOTYPE DEVELOPMENT AND TEST
• County and state leadership about education-based infrastructure related factors including policy, funding, and opportunity. (Phase 1.1) • Educators to explore capacity, opportunities, and resources related to STEM based education. (Phase 1.1)	• NCCU college students both rural and urban counties to assess experience, exposure, engagement, and barriers related to STEM coursework. (Phase 1.1)	• NCCU students to identify social determinants related to educational attainment and STEM coursework and degree selection. (Phase 1.2)	• Developing an intervention prototype based on the data collected in Activities 1-4 and evaluate a pilot test of this prototype through interviews and surveys with student participants. (Phase 2)

PRELIMINARY RESULTS

STRUCTURED INTERVIEWS (N=15)

- County and state leadership about education-based infrastructure related factors including policy, funding, and opportunity. (Phase 1.1)
- Educators to explore capacity, opportunities, and resources related to STEM based education. (Phase 1.1)

Barriers identified by both rural and urban:

- Need to hire qualified STEM instructors for high school level

FOCUS GROUPS/LISTENING SESSIONS (N=200)

- NCCU college students both rural and urban counties to assess experience, exposure, engagement, and barriers related to STEM coursework. (Phase 1.1)

Facilitators:

- Familial relationship with someone in field
- Support by a teacher/mentor

Barriers

- Awareness
- Self-efficacy

SURVEYS

- NCCU students to identify social determinants related to educational attainment and STEM coursework and degree selection. (Phase 1.2)

Facilitators:

- Familial support
- Family influence
- Exposure

Barriers:

- STEM programming perceived to opportunities for those with high GPS
- Self-select/teacher-select

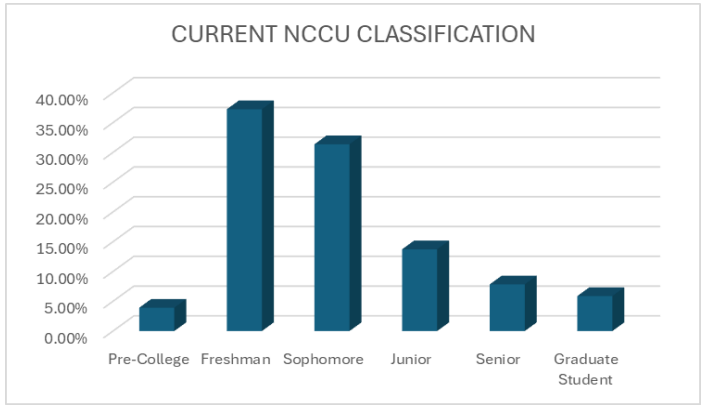
PROTOTYPE DEVELOPMENT AND TEST

- Developing an intervention prototype based on the data collected in Activities 1-4 and evaluate a pilot test of this prototype through interviews and surveys with student participants. (Phase 2)

NCCentral UNIVERSITY

PROSTEM

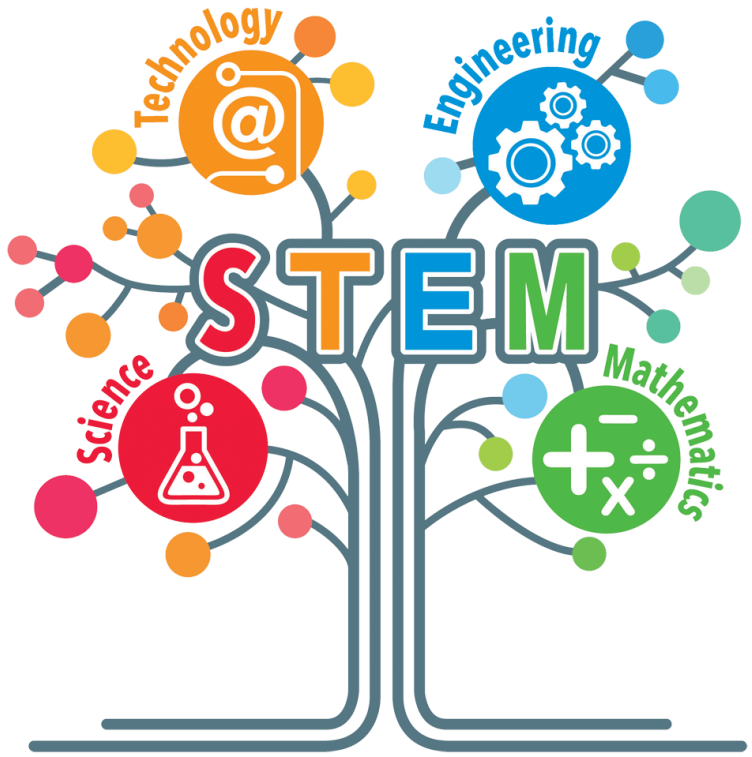
PRELIM SURVEY RESULTS



- **Demographics**
  - 82% 18-21 Years of Age
  - 84% Black or AA/13% Hispanic or Latino
  - 76% Female
- **High School STEM Opportunities**
  - 41% Perceived that HS STEM-based opportunities were for students with top GPAs
- **College**
  - 88% of families were “very/somewhat involved” in decision to choose NCCU
  - 68% of families were “very/somewhat involved” in major selection
  - **Choosing a major**
    - 39% Chose a topic that they had a longstanding previous interest in
    - 23% Chose a topic that they became interested in during high school
    - 13% Chose based on potential salary
    - 11% Chose a topic that came easy to them

Summary

- Where and when to focus efforts?
- Exposure vs. Immersion
- Workforce development



Rural Veteran Personality, Delay Discounting, and the Interference Preservation Hypothesis

Award #: 2321159

PI: Justin McDaniel, PhD
Associate Professor
School of Human Sciences
College of Health and Human Sciences
Southern Illinois University
veteranlab.siu.edu

Project Goals

- Background
  - Military to civilian transition is difficult and often challenged further when a veteran must reintegrate into the civilian workforce
  - To support veteran reintegration, Congress signed into law the Supporting Veterans in STEM Careers Act in 2020
  - Only 7% of veterans nationally (and 3% in Illinois) are involved in an NSF-designated STEM occupation
  - Rural veterans are 50% less likely to be involved in a STEM occupation[1]
- Goals
  - Recruit rural-dwelling veteran students into a micro-credential focused on R Studio-based data science and machine learning
  - Make determinations about the unique educational preferences of this population to stimulate interest in STEM

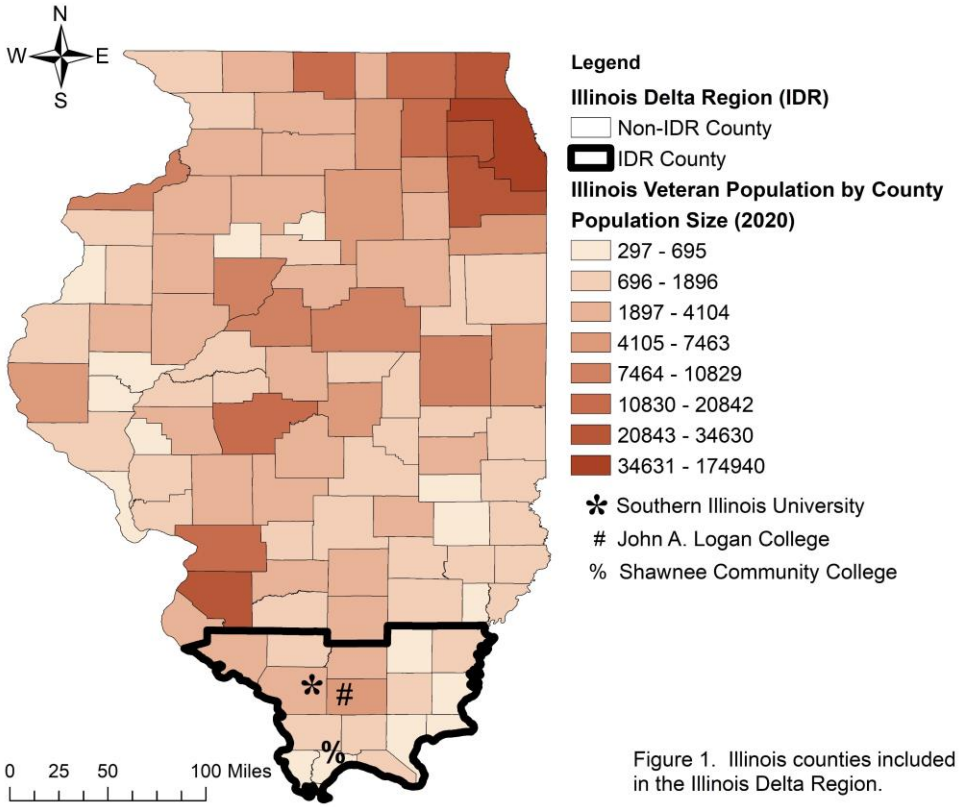
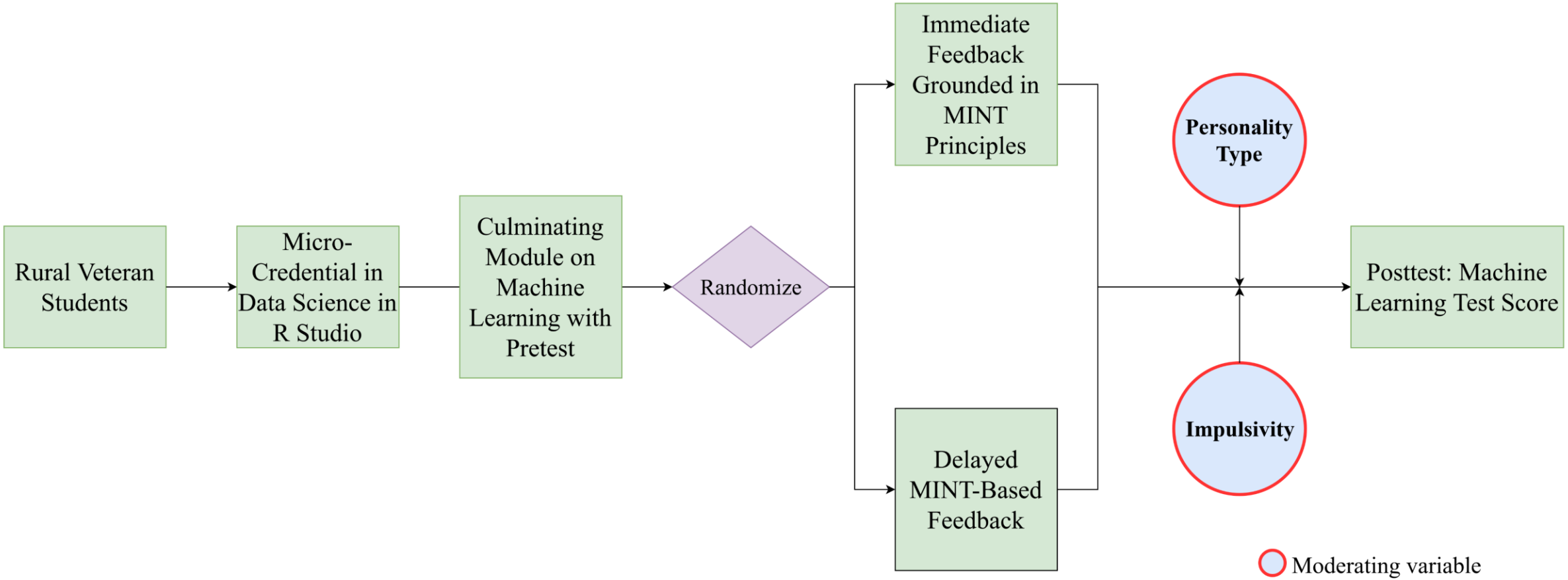


Figure 1. Illinois counties included in the Illinois Delta Region.

[1] McDaniel, J.T., et al. (2023). Rural military veterans of color and STEM occupational outcomes. Armed Forces and Society.

Intellectual Merit



* MINT = Motivational Interviewing

Broader Impacts

- Creation of a sustainable STEM program tailored to the unique needs of rural veterans
  - Micro-Credential/Badge called "**M**achin**E** **L**earning **T**raining for **VET**erans" (MELT-VET)
- Inclusion of a rural-dwelling military veteran graduate assistant from an underrepresented racial group in STEM

“Before this project I didn’t want anything to do with STEM, but now I want my future to involve STEM” - AISL participant

CAST

University of New Hampshire

STEM Pathways for Rural Youth: Developing STEM Identity Through the Outdoors

NSF AISL #2213919

Pilot and Feasibility Study conducted in Northern Rural New Hampshire (2022-2024)

Amanda Bastoni (Principal Investigator, CAST)

Sam Catherine Johnston (CAST)

Andrew Coppens (UNH)

Jayson Seaman (UNH)

Project Goals and Outcomes

Video on YouTube

© 2020 CAST | Until learning has no limits

Intellectual Merit: Building Rural STEM Education & Workforce Development Programs

- **Utilize youth interests and rural assets** (i.e., outdoor recreation) to "spark" STEM career aspirations & identity development in rural places
- Position **youth as co-researchers or co-workers** (provide incentives for their work); ensure family and peer involvement in programs/activities
- Use technology with **Universal Design for Learning** elements (Bastoni et al., in press; Connected Science Learning)
- Understand the **benefits and constraints of schools and schooling** on rural youth STEM identity development (especially for rural boys)

© 2020 CAST | Until learning has no limits

Broader Impacts in Rural America

"I feel like my visions and overall look at life have improved since starting this project. I am more motivated, and I am thinking more about careers in STEM and outdoor recreation. This makes me wonder what my future will look like, and if it will look different now that I've done this project." - AISL participant

- Enhance **community resources, mentoring, and infrastructure** for integrated STEM learning ecosystem in rural areas, including cultural ways of knowing STEM
- Develop **rural place-based STEM educational and workforce pathways** (career and technical education, apprenticeships, STEM workforce development)
- Support **psychosocial identity synthesis and future orientation** in rural places,; **reducing "stay vs. leave" dichotomy** that rural youth often experience in pursuing "good jobs"

© 2020 CAST | Until learning has no limits

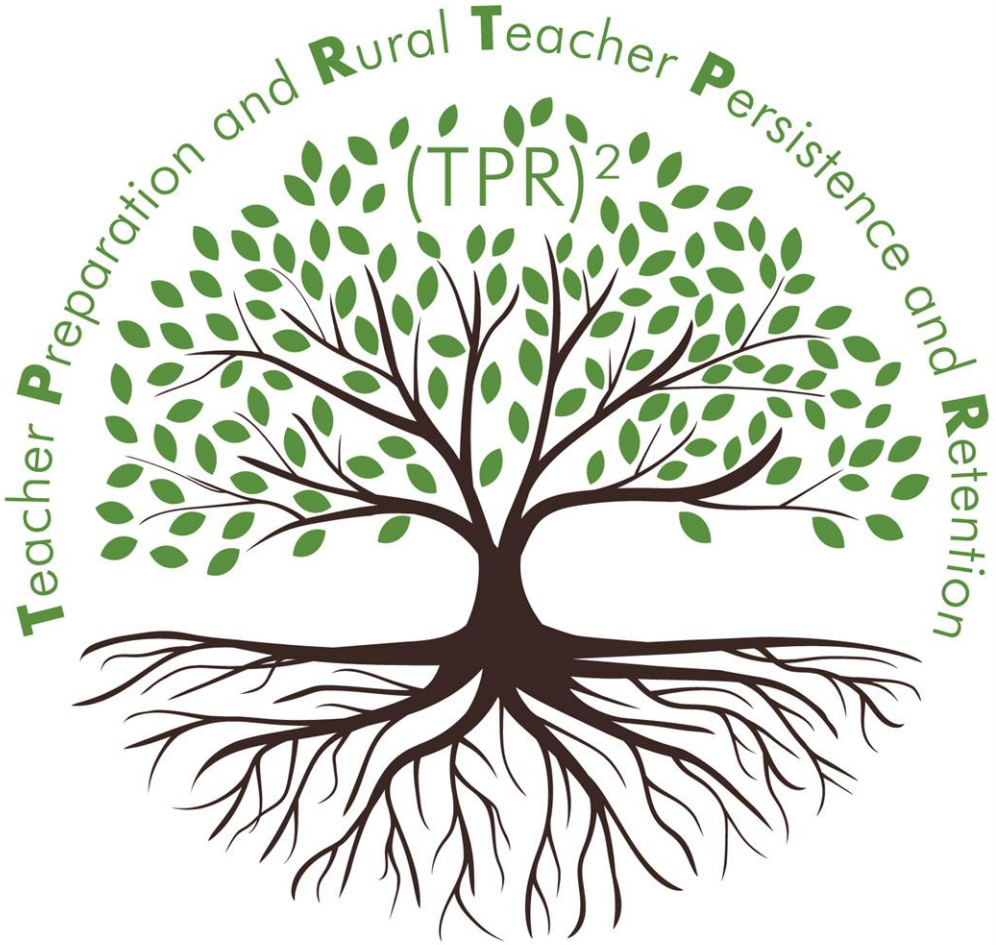
Resources & Connections

- Universal Design for Learning: Strategies for Engaging Rural Youth Co-Researchers with Informal STEM Learning
- CAST
- UNH
- NH OR Competencies
- Outdoor Industry Association
- Outdoor Foundation (participation data)
- Confluence of States
- Outdoor Recreation: Connecting Rural Youth with STEM Careers
- CAST to Investigate How Outdoor Recreation Can Foster Positive STEM Identities and Pathways for Rural Youth
- Georgetown center for education and the workforce
- NH Learning Initiative *Power of career connected learning*
- University of Wisconsin demographic database

© 2020 CAST | Until learning has no limits

Noyce Track 4: Collaborative Research

Teacher Candidates' Intentions to Teach in a Rural School: Results from a Survey of STEM Teacher Candidates at Fourteen Rural Serving Institutions

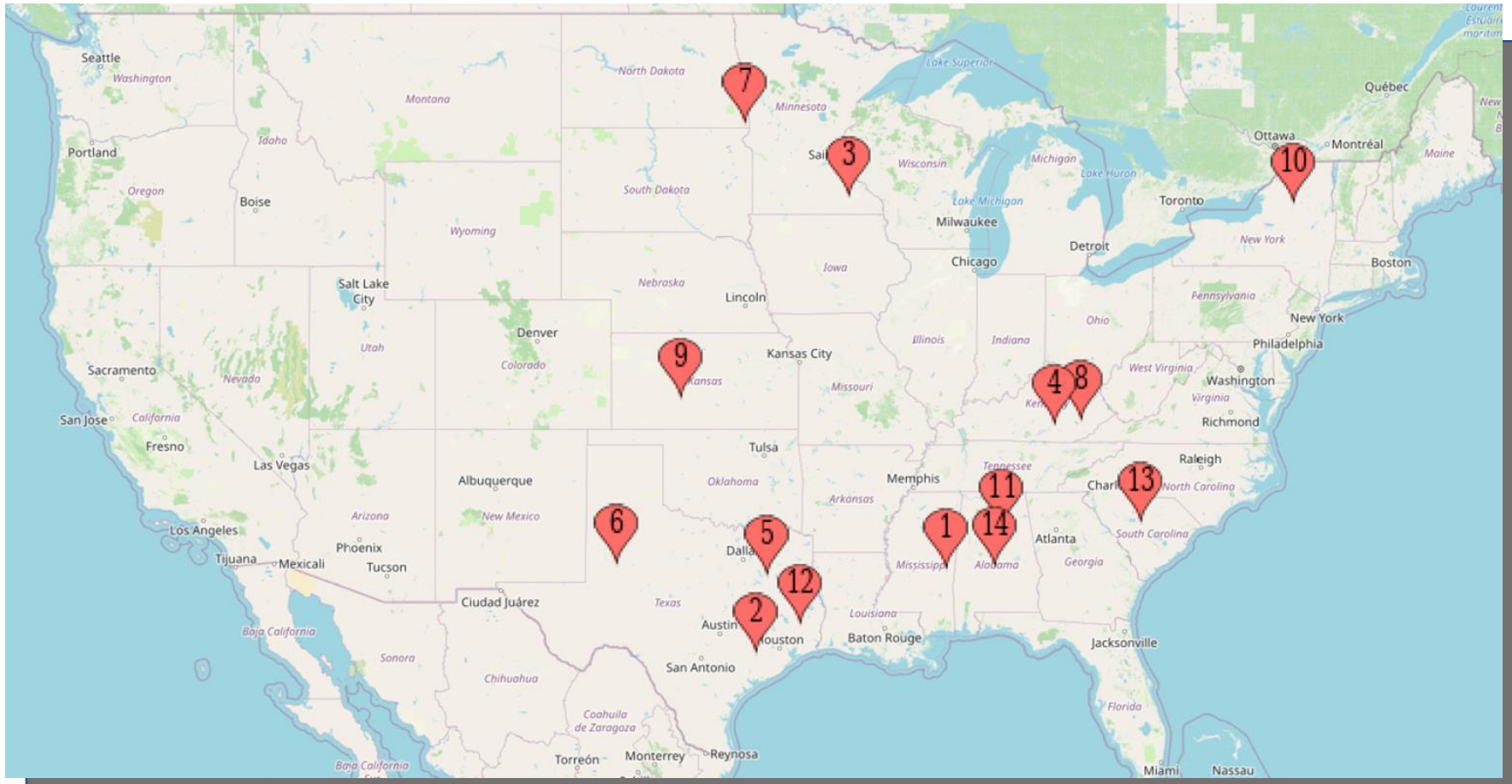


Dana Pomykal Franz, PhD Mississippi State University

Collaborative Research: Investigating STEM Teacher Preparation and Rural Teacher Persistence and Retention project is supported by the National Science Foundation, lead awards 2050099, 2050108 and 2050249.

$(TPR)^2$ Collaborating Institutions

1) Mississippi State University*
2) Texas A&M University – College Station*
3) University of Wisconsin-River Falls
4) University of Kentucky
5) Texas A&M University – Commerce
6) Texas Tech University
7) North Dakota State University
8) Morehead University
9) Fort Hays State University
10) Clarkson University
11) Alabama A&M University
12) Stephen F. Austin University*
13) Winthrop University
14) University of Alabama at Birmingham



Intellectual Merit: The overarching theory guiding this study is that EPPs that explicitly address the unique contexts of rurality may support recruitment, retention, and persistence in rural schools which can lead to a more diverse and effective STEM teaching force for rural schools. Research suggests that a consistent, well-prepared teacher force leads to greater student achievement.

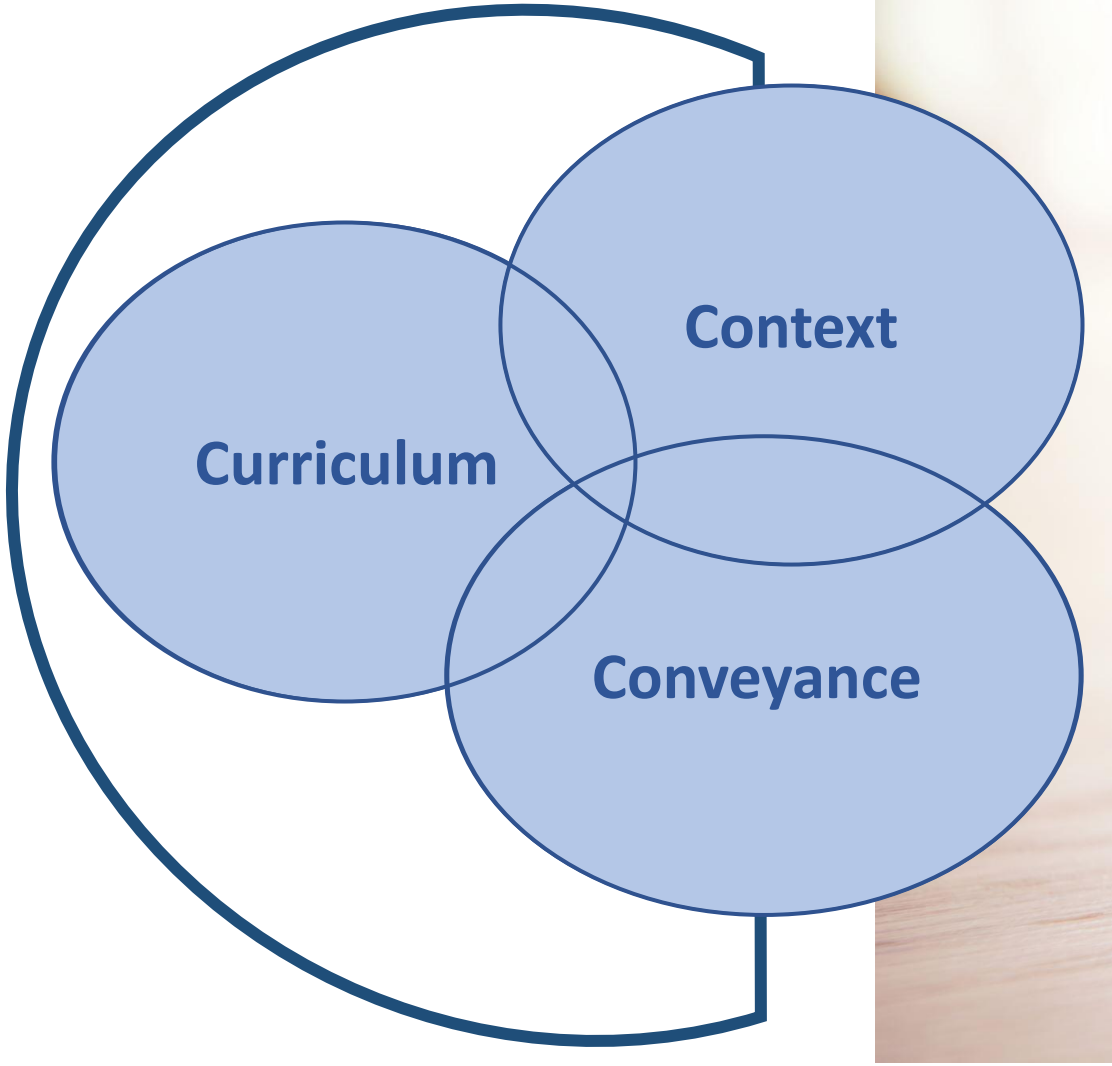
Broader Impact: There is increasing evidence that teachers with thorough preparation are more likely to continue in the field. The broader impact of this collaborative research project will be a greater understanding of the programmatic features of educator preparation programs and Noyce programs that support rural STEM teacher persistence and retention.

Goal: *Designed to better understand how STEM EPPs impact the decisions preservice teachers make regarding the geographic area in which they choose to start teaching and remain to teach throughout their careers.*

TPR2: Research Questions

1. How do rural serving EPPs address rurality? What features of EPPs are intended to prepare program completers for employment as a STEM teacher in rural schools?
2. What programmatic features of the EPPs impact teacher candidates' intentions to teach STEM in rural schools? How do these programmatic features impact the teacher candidates' intentions?
3. What programmatic features of the EPPs impact program completers' decisions to accept their first teaching position in rural STEM classrooms? How do these programmatic features impact the teacher candidates' decisions?
4. What programmatic features of the EPP impact program completers' decisions to persist in teaching STEM at the same rural campus? In what ways do these features impact the teacher candidate's decisions and long-term plans to persist at the same rural campus?
5. What impacts program completers' retention, that is, their decisions to keep teaching STEM in (a) rural or (b) non-rural schools, but not necessarily at the same campus? In what ways do these features impact the teacher candidate's decisions to remain teaching STEM in (a) rural or (b) non- rural schools?

Three C's Framework



Preparing Pre-Service Teachers for Rural Schools

Amy Price Azano, Jayne Downey and Devon Brenner

https://doi.org/10.1093/acrefore/9780190264093.013.274

Published online: 23 May 2019

Summary

Preparing pre-service teachers for rural schools has been a challenge in the field of education for more than a century, and issues specific to the rural teacher workforce remain a persistent and salient challenge in the United States and

Conclusions after 3 years:

- Preservice teachers did not report that experiences in teacher education had a strong influence on their plans to teach in rural districts—for many because rural field experiences, assignments, and discussions were not a part of teacher preparation.
- For others because they already planned to teach in a rural place before beginning educator preparation or because they did not plan to teach in a rural area and did not change their minds during educator preparation. In fact, our data suggest that very little “rural” is happening in educator preparation.
- As more programs place a greater emphasis on explicit preparation for rural teaching positions, the Teacher Intention Survey may provide a useful tool for understanding how and if teachers’ intentions about where they might teach change over time and the influence of types of experiences in educator preparation on their intentions.
- We believe the TIS is a valid instrument that rural education scholars can use or adapt for future studies about beginning teachers’ intentions to teach in rural areas and their views of features of educator preparation.

NSF INCLUDES Alliance: Expanding the First2 STEM Success Network

- **Sue Ann Heatherly, Green Bank Observatory, HRD-1834601**
- **Erica Harvey, Fairmont State University, HRD-1834575**
- **Sarah Riley. High Rocks Educational Corporation, HRD-1834595**
- **Gay Stewart, West Virginia University, HRD-183469**
- **Juliana Serafin, WV Higher Education Policy Commission, HRD-1834586**

Partnership of undergraduate STEM students, higher ed faculty, state policy experts, and industry leaders working to build a **Next Generation Appalachian economy** by doubling first-gen student success in Science, Technology, Engineering and Math.

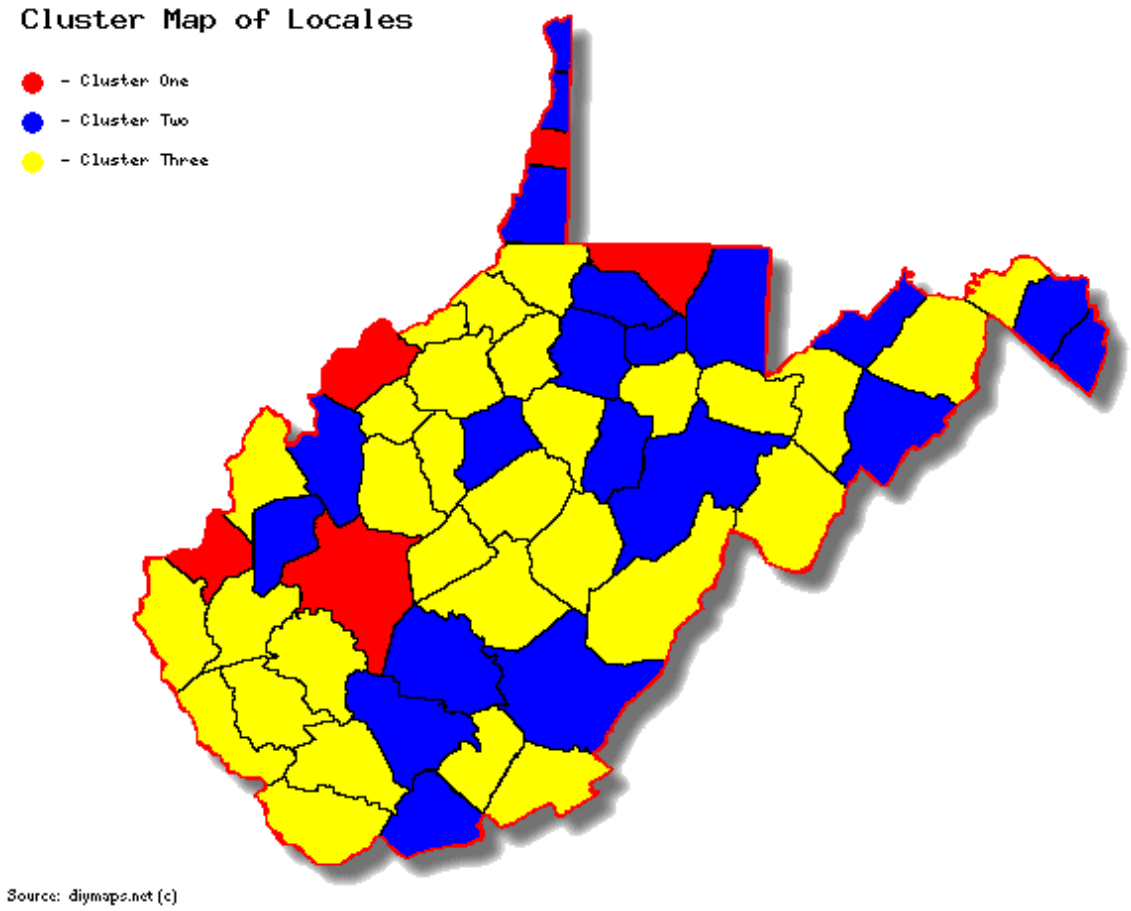
The First2 Network is supported by the National Science Foundation under Award Numbers: HRD-1834601, Green Bank Observatory; HRD-1834575, Fairmont State University; HRD-1834586, Higher Education Policy Commission; HRD-1834595, High Rocks Educational Corporation; HRD-1834569, West Virginia University.

College Readiness- Rurality & Opportunities:

Cluster 3: More rural; fewer cultural STEM opportunities.

Lack of civic facilities depresses AP credit and High School GPA which in turn depresses college GPA.

College GPA influences persistence



Networked Improvement Community

PRIMARY DRIVER #1
STEM Students succeed academically

PRIMARY DRIVER #2
Connections to institutional team to promote belonging

Central Aim of the FIRST2 NETWORK:
Double the graduation rate of rural, first-generation and other underrepresented students with a declared STEM major.

PRIMARY DRIVER #3
Connections for research and career

PRIMARY DRIVER #4
Leadership experience

NSF
FIRST2 NETWORK

Driver 3: Gaining workplace experience:

First2 summer research immersion data show a 67% persistence rate among the students who participated in the research experiences as compared to 27% 6-year graduation rate in the overall STEM student population.

The most important factors related to their motivation to remain STEM majors, as cited by students in surveys, were the research experience and/or hands on experience they received.

However: First-Gen Rural Undergraduate Students may not take research opportunities:

- more likely to work outside of school
- more likely to go home every weekend
- access to opportunities

Session 3 Discussion Questions

1. For many research questions, the research setting isn't as important as what is being uncovered. However, for other research questions, the setting, itself, is critical. What research questions just simply need to be conducted in a rural or remote environment?
2. The translation of research findings into effective practice remains a priority of EDU. What information did you hear today that has compelling implications for STEM education practices for rural and remote communities?
3. What might EDU do to help increase the adoption of such research findings into practice, particularly in rural and remote communities?

BREAK 3:35 – 3:50 p.m.

SESSION 4: Breakout Discussion – Unleashing Opportunities in Rural and Remote Communities

Session 4 Discussion Questions

1. What did you hear from today's discussion that made you excited and hopeful?
2. What are the grand challenges for which EDU needs to attend to assure we unleash opportunities in rural and remote environments for STEM Education and Workforce Development?
3. What role might partnerships play in our approach to Rural STEM Education and Workforce Development?
4. What education and workforce development approaches should EDU prioritize?

CLOSING SESSION for DAY 1
4:50 – 5:15 p.m.

DAY 2: EDU Spring 2024 AC Meeting

EDU | DIRECTORATE FOR STEM EDUCATION

Directorate for STEM Education 2024 Spring Advisory Committee Meeting:

AC Chair - Day 2 Recap

DR. MARILYN STRUTCHENS

EMILY R. AND GERALD S. LEISCHUCK ENDOWED PROFESSOR
AUBURN UNIVERSITY

May 30, 2024

SESSION 5: Rural STEM Education and Workforce Development Across EDU Divisions

Moderator: Charisse Carney-Nunes
Dr. Monya Ruffin
Dr. Jessie Dearo
Dr. Jennifer Ellis
Dr. Jackie Huntoon

EDU | DIRECTORATE FOR STEM EDUCATION

Division of Research on Learning in Formal and Informal Settings (DRL):

Rural STEM Education

MONYA RUFFIN, PHD

ACTING DIVISION DIRECTOR

EDU AC Meeting: May 29 – 30, 2024

Directorate for STEM Education (EDU)

The U.S. National Science Foundation's Directorate for STEM Education works to develop a well-informed citizenry and a diverse and capable workforce of scientists, technicians, engineers, mathematicians and educators

EDU Office of the Assistant Director (OAD)

- **Division of Graduate Education (DGE)**
- **Division of Equity for Excellence in STEM (EES)**
- **Division of Research on Learning in Formal and Informal Settings (DRL)**
- **Division of Undergraduate Education (DUE)**

Broadening Participation & Institutional Capacity

TEM Professional Workforce Development

STEM Learning and Learning Environments

EDU | DIRECTORATE FOR STEM EDUCATION

DRL Overview

Credit: NSF

Credit: Photo of SciTech Center, Aurora, Ill., by the Beacon News

Credit: San Francisco Exploratorium

Credit: SciGrils, Twin Cities Public Television

U.S. National Science Foundation
Directorate for STEM Education

Preparing a diverse STEM workforce and a well-informed citizenry

Division of Research on Learning in Formal & Informal Settings (DRL)

DRL invests in projects to improve the effectiveness of STEM learning for people of all ages.

Its mission includes promoting innovative research, development, and evaluation of learning and teaching across all STEM disciplines by advancing cutting-edge knowledge and practices in both formal and informal settings.

DRL Programs

CORE

Discovery Research PreK-12 (DRK-12)

Advancing Informal STEM Learning (AISL)

Innovative Technology Experiences for Students and Teachers (ITEST)

EDU-Wide

EDU Core Research (ECR:CORE)

EDU Core Research: Building Capacity in STEM Education Research (ECR: BCSER)

Racial Equity in STEM Education (Racial Equity)

NSF-Wide

Research on Innovative Technologies for Enhances Learning (RITEL)

Faculty Early Career Development Program (CAREER)

Computer Science for All (CSforAll)

Eddie Bernice Johnson INCLUDES

National Artificial Intelligence Research Institutes (NAIRI)

DRL Staff

Acting Division Director

Monya Ruffin

Acting Deputy Division Director

Eric Knuth

Program Support Manager

Iesha McGhee

Operations Specialist

Adina Apedo

Program Analysts

Carol McGee
Katie Schreyer

Science Assistant

Jey Willmore

Program Assistants/MOA

Anne Carroll
Joyce Burch
Kathy Montgomery
Keenon Workman

Intermittent Expert

Bob Russell
Elizabeth VanderPutten
Stephanie Teasley

Program Specialists

Cedil Morgan
Jacenta Curtis
Shavonne Forrest
Sheereena Diggs
Sheryl Miller
Terri Green (on detail)

Current IPAs

Adrienne Dixon
Asli Sezen Barrie
Deena Khalil
Fengfeng Ke
Jessaca Spybrook
Jonathan Singer
Melissa Luna

Current Program Officers

Alicia Santiago
Amy Wilson-Lopez
Amy Baylor
Arlene de Strulle
Barry Sloane
Chia Shen
David Daniels
Ellen McCallie
Gregg Solomon
Jennifer Noll
Joan Walker
Jolene Jesse

Current Program Officers

Julie Johnson
Kevin Clark
Leilah Lyons
Lori Takeuchi
Lynn Tran
Margret Hjalmarson
Michael Ford
Rob Ochsendorf
Toni Dancstep
Toya Frank
Wu He

EDU | DIRECTORATE FOR STEM EDUCATION

CHIPS + Science Act Rural Education

U.S. National Science Foundation
Directorate for STEM Education

Preparing a diverse STEM workforce and a well-informed citizenry

NASEM Report: K-12 STEM Education and Workforce Development in Rural Areas

The 2022 CHIPS and Science Act directed NSF to support the National Academies in conducting a consensus study on preK-12 rural STEM education and workforce development

The National Academies of Science, Engineering, and Medicine (NASEM) committee sought to:

1. Evaluate the quality and quantity of current federal programming and research
2. Assess the impact that the scarcity of broadband connectivity in rural communities, and the affordability of broadband connectivity, have on STEM and technical literacy
3. Assess the core research and data needed to understand the challenges rural areas are facing, as well as the assets embedded in these communities;
4. Make recommendations for action at the federal, state, and local levels for improving STEM education; and
5. Make recommendations to inform the implementation of programs in sections 10512 (“National Science Foundation Rural STEM Activities”) and 10513 (“Opportunities for Online Education”), which include the National Science Foundation's funding for rural STEM activities and online STEM education and mentoring in rural communities.

EDU | DIRECTORATE FOR STEM EDUCATION

DRL Rural Educational Portfolio

U.S. National Science Foundation
Directorate for STEM Education

Preparing a diverse STEM workforce and a well-informed citizenry

Defining Dimensions of "Rural"

Topic

Investments that **focus on rural but may or may not be in rural locations**

Rural may be the project's intellectual merit, for example:

- Research Topic
- Focus area
- Focus of recruitments of participants
- Area of interest

Physical address of the organization may be in a rural locale

Operationalizing "rural locale"

Multiple Classification Schemes Across Federal Agencies

Locale

Investments **in rural (nonmetro) locations**

DRL Rural Portfolio – *Overview*

DRL is currently supporting **165 active projects** with rural as a topic, within a rural (nonmetro) locale, or both (i.e., rural as a topic *and* within a rural locale).

135

DRL projects with rural as a topic

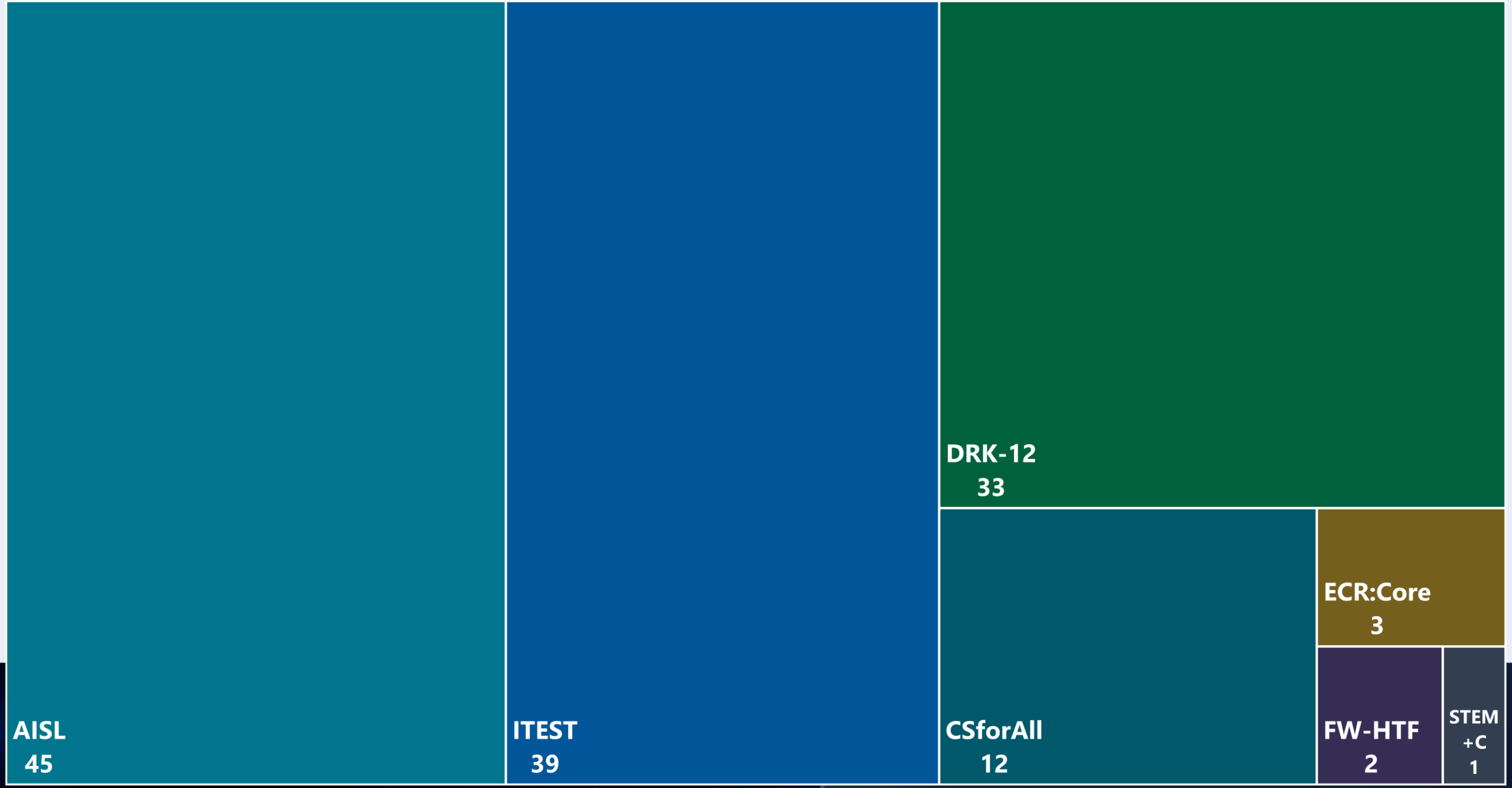
16

DRL projects within a rural locale

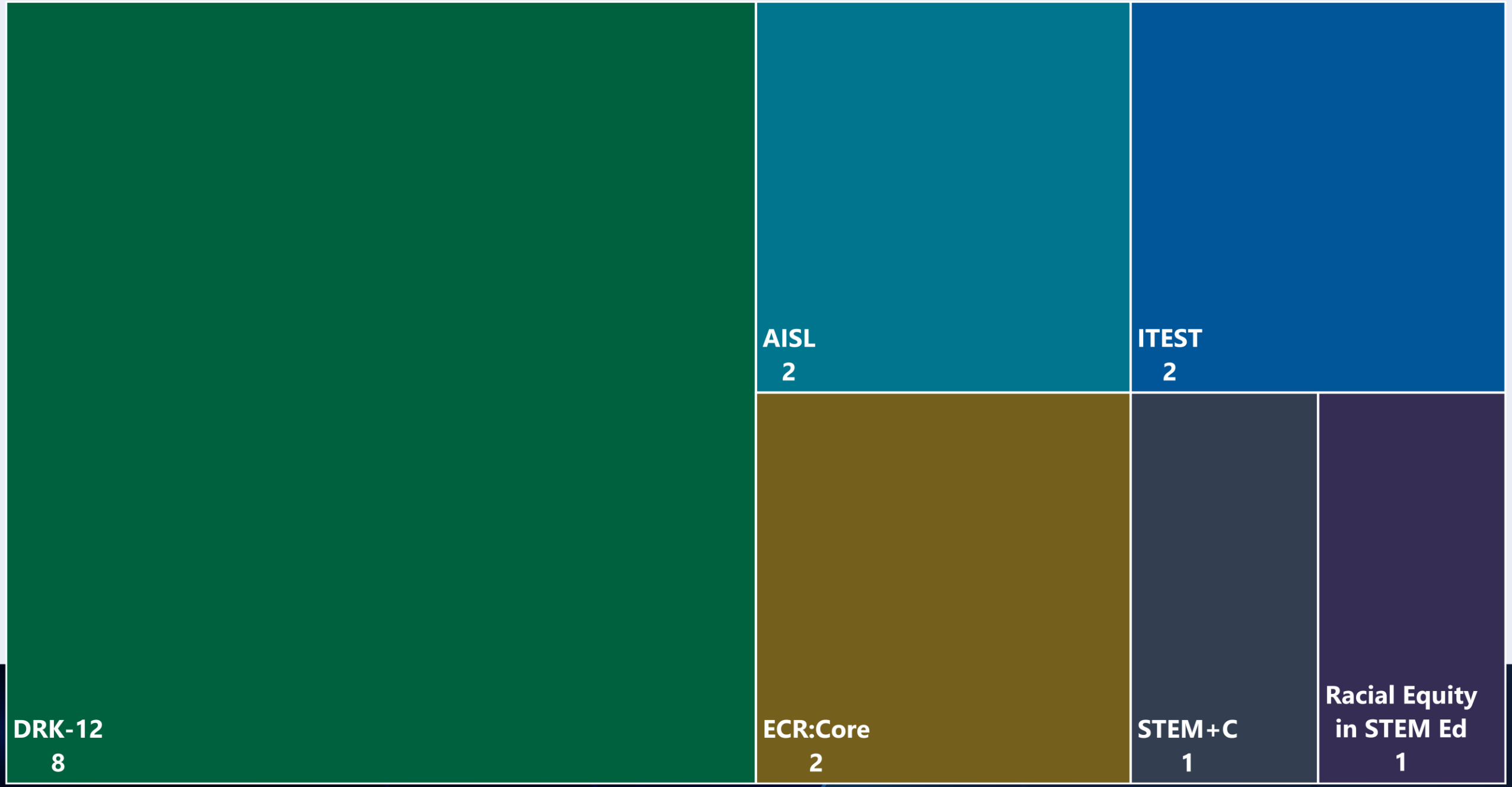
14

DRL projects with rural as a topic *and* within a rural locale

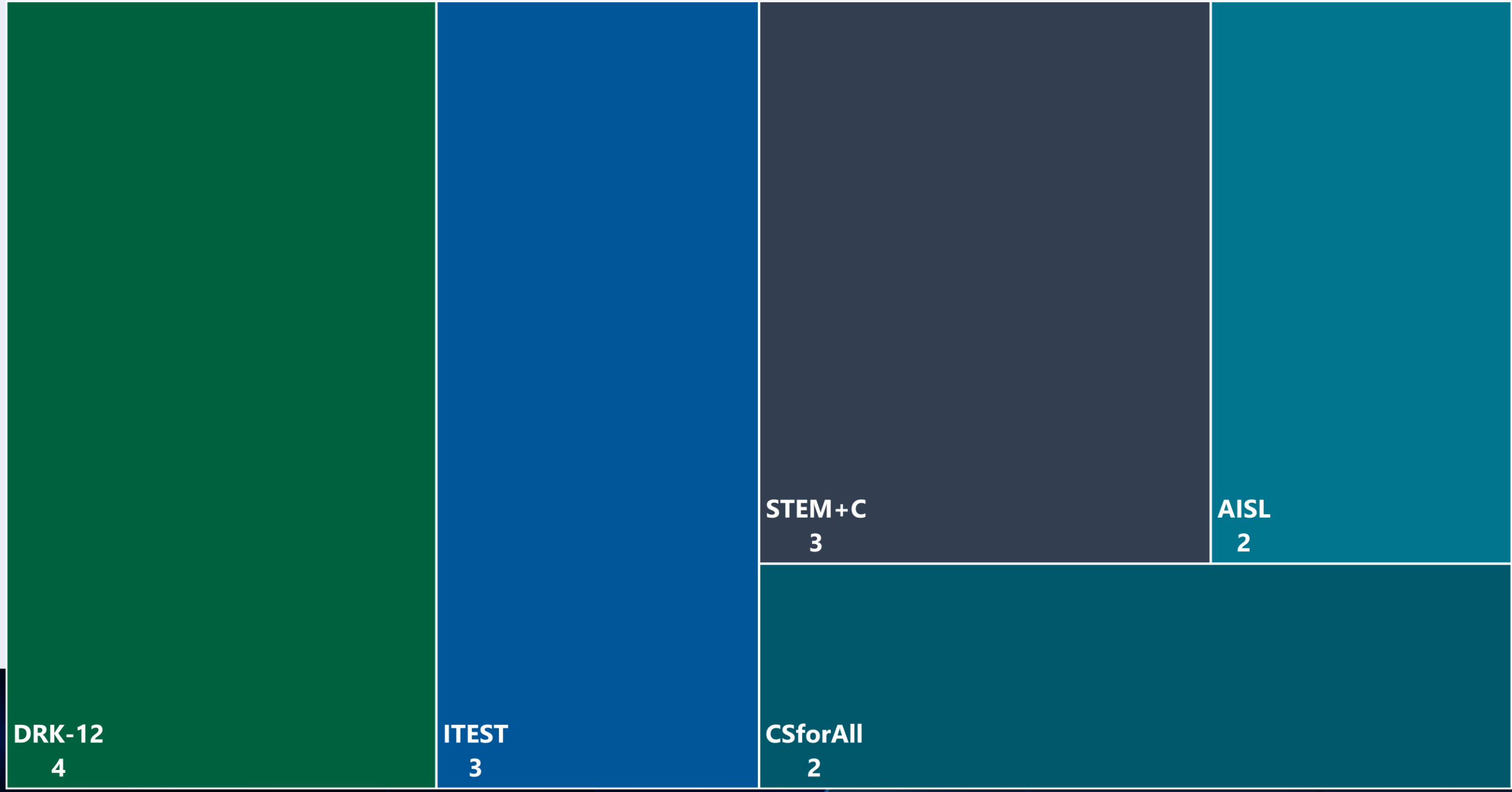
DRL Projects (135) with Rural as a Topic – By Program



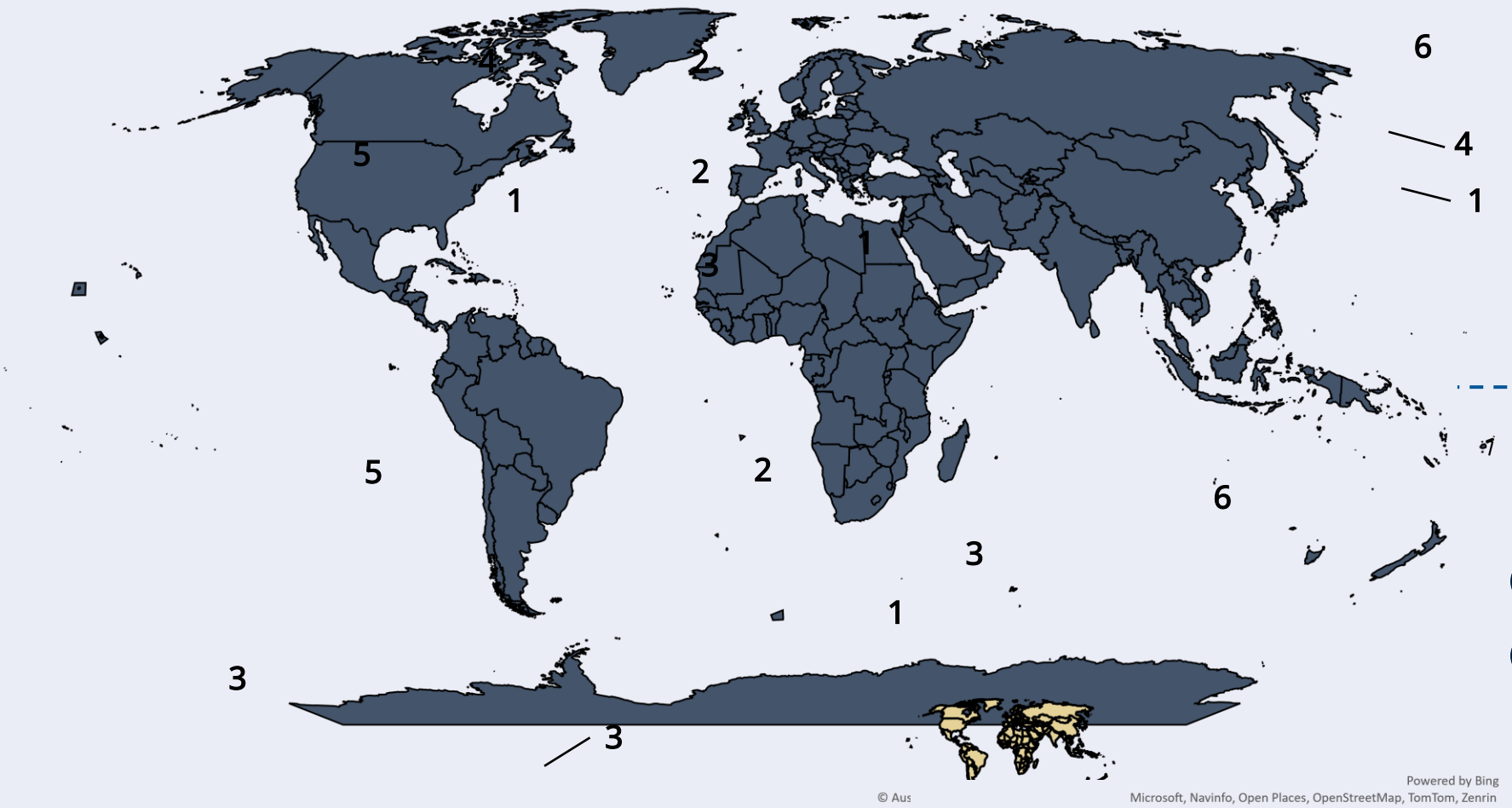
DRL Projects (16) within a Rural Locale – By Program



DRL Projects (14) with Rural as a Topic *and* Within a Rural Locale – By Program



DRL "Rural" Educational Portfolio – *Geography & EPSCoR*



Of the 165 active projects, 47 projects included and/or were led by institutions or PIs in EPSCoR jurisdictions.

- States with rural projects
- EPSCoR jurisdictions with rural projects
- States/jurisdictions with no active rural projects

DRL "Rural" Educational Portfolio – *Geography & EPSCoR*

State	Total Active Awards
Alabama	3
Alaska	3
Arizona	5
Arkansas	0
California	11
Colorado	6
Connecticut	0
Delaware	0
Florida	2
Georgia	5
Guam	0
Hawaii	5
Idaho	5

State	Total Active Awards
Iowa	1
Kansas	1
Kentucky	1
Louisiana	1
Maine	6
Maryland	0
Massachusetts	11
Michigan	2
Minnesota	1
Mississippi	3
Missouri	4
Montana	2

State	Total Active Awards
Nebraska	3
Nevada	0
New Hampshire	4
New Jersey	0
New Mexico	0
New York	7
North Carolina	9
North Dakota	2
Ohio	2
Oklahoma	2
Oregon	2
Pennsylvania	8

State	Total Active Awards
Puerto Rico	0
Rhode Island	1
South Carolina	6
South Dakota	2
Tennessee	2
Texas	5
Utah	5
Vermont	0
Virginia	10
Washington	5
West Virginia	0
Wisconsin	1
Wyoming	1

DRL "Rural" Educational Portfolio – *Research Question Examples*

In what ways do teachers apply learning from Indigenous STEM into their curricular and pedagogical choices?

What types of technology-driven and innovative learning experiences are effective in increasing rural, Black, and Latinx/Hispanic middle school students' AI interest, knowledge, skills, self-efficacy, and interest in AI careers?

What social roles do children and parents play in supporting each other's science learning and connections to rural communities?

Do storytelling and story-making serve as effective means for engaging middle-school students in computer science?

What instructional and mentoring strategies can be effectively integrated in to boost minority high school students' knowledge, interest, and attitudes towards STEM-related careers?

How can we create engaging AI learning experiences for diverse rural populations of middle school students through game design activities?

DRL Project Example

"Understanding Weather Extremes with Big Data: Inspiring Rural Youth in Data Science"

(Award ID: 1850447 | Funding Program: ITEST)

Credit: www.edc.org/WeatherX

EDU | DIRECTORATE FOR STEM EDUCATION

Division of Equity for Excellence in STEM (EES) Overview

JESSIE DEARO, PHD
ACTING DIVISION DIRECTOR
EDU AC Meeting: May 29 – 30, 2024

Directorate for STEM Education (EDU)

The U.S. National Science Foundation's Directorate for STEM Education works to develop a well-informed citizenry and a diverse and capable workforce of scientists, technicians, engineers, mathematicians and educators

EDU Office of the Assistant Director (OAD)

- **Division of Graduate Education (DGE)**
- **Division of Equity for Excellence in STEM (EES)**
- **Division of Research on Learning in Formal and Informal Settings (DRL)**
- **Division of Undergraduate Education (DUE)**

EDU | DIRECTORATE FOR STEM EDUCATION

Division of Equity for Excellence in STEM (EES)

EES envisions a well-prepared and competitive U.S. workforce of scientists, technicians, engineers, mathematicians, and educators that reflects the diversity of the U.S. population.

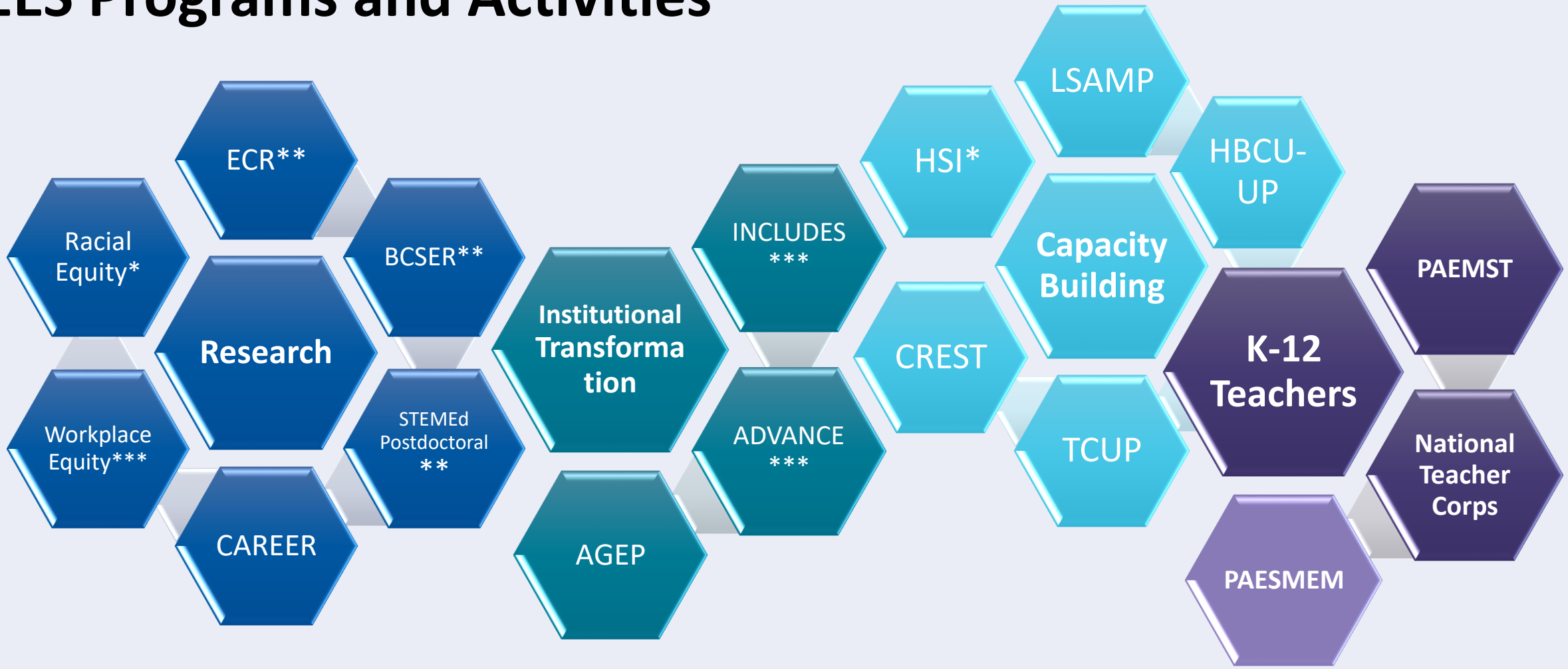
MISSION: To grow an innovative and competitive U.S. STEM workforce to sustain and advance the Nation's prosperity by supporting the broader participation and success of individuals currently underrepresented in STEM and the institutions that serve them.

Expand Opportunities

Knowledge Building

Knowledge Utilization

EES Programs and Activities



*** Multiple Directorates/NSF wide ** EDU wide * Multiple EDU Divisions

EES Rural Portfolio – *Overview*

EES is currently supporting **133 active projects** awarded in (2018-2023) with rural as a topic or within a rural (nonmetro) locale or both (rural as a topic *and* within a rural locale).

33

EES projects with rural as a topic

84

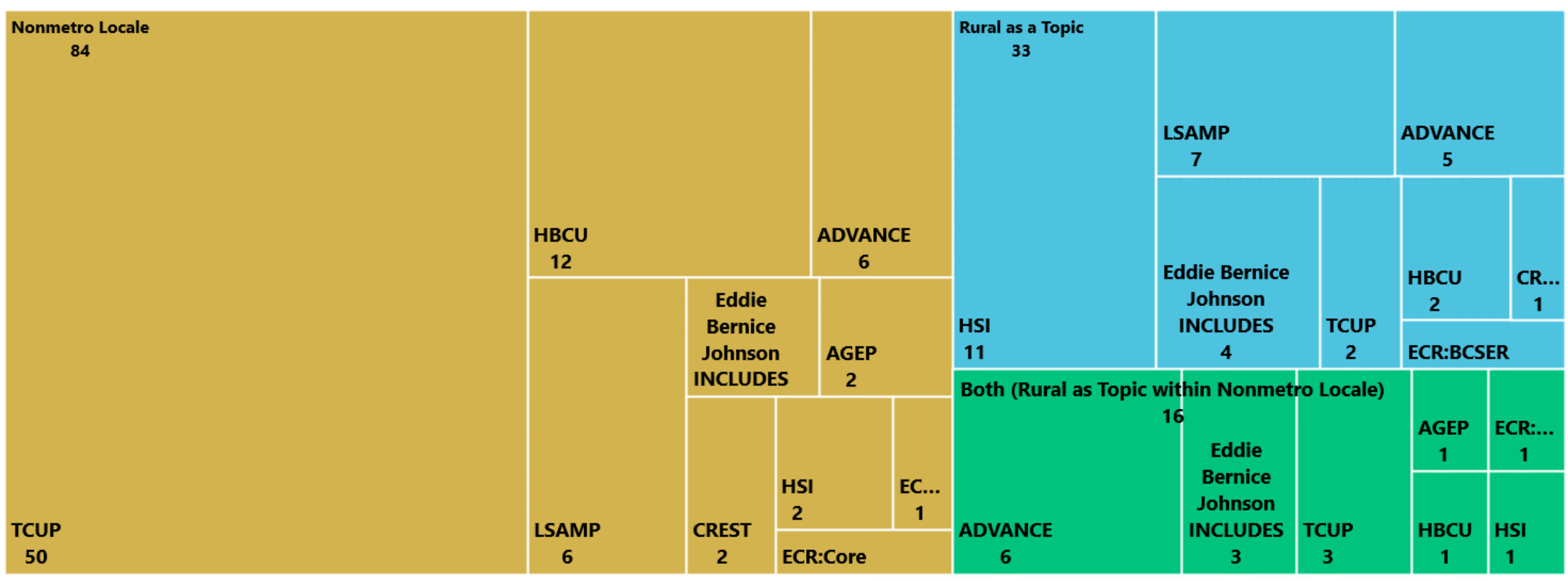
EES projects within a rural locale

16

EES projects with rural as a topic *and* within a rural locale

Division of Equity for Excellence in STEM (EES)

Investments in nonmetro locales and/or on rural topics



EES "Rural" Education Portfolio – *Additional Examples*

South Florida State College
HSI:IUSE (2345349)

- Pilot project to address the under participation of Hispanic students in STEM programs at the rural campuses of the IHE.
- The lack of intro STEM lab experiences at the rural campuses with the largest Hispanic enrollment excludes those students from STEM because they cannot transfer or earn STEM degrees without these experiences.
- This project will develop on-line STEM labs to mitigate this barrier to participation in STEM.

Appalachian State University
ADVANCE (2017536)

- Partnered with Human Resources to redesign the Office of Relocation and Dual Career Assistance
  - Hired an Assistant Director and administrative assistant with responsibilities for work life initiatives, programs, and advocacy for all staff (not just faculty).
- Launched the University Work-Life Council to advise the administration on work-life issues in the future.
- Created a new pipeline for early childhood education certifications with a community college and the county school system.

Directorate for STEM Education (EDU)

The U.S. National Science Foundation's Directorate for STEM Education works to develop a well-informed citizenry and a diverse and capable workforce of scientists, technicians, engineers, mathematicians and educators

EDU Office of the Assistant Director (OAD)

- **Division of Graduate Education (DGE)**
- **Division of Equity for Excellence in STEM (EES)**
- **Division of Research on Learning in Formal and Informal Settings (DRL)**
- **Division of Undergraduate Education (DUE)**

EDU | DIRECTORATE FOR STEM EDUCATION

Division of Undergraduate Education (DUE) Rural Educational Portfolio

JENNIFER ELLIS, PHD

NOYCE PROGRAM LEAD PROGRAM OFFICER

EDU AC Meeting: May 29 – 30, 2024

U.S. National Science Foundation
Directorate for STEM Education

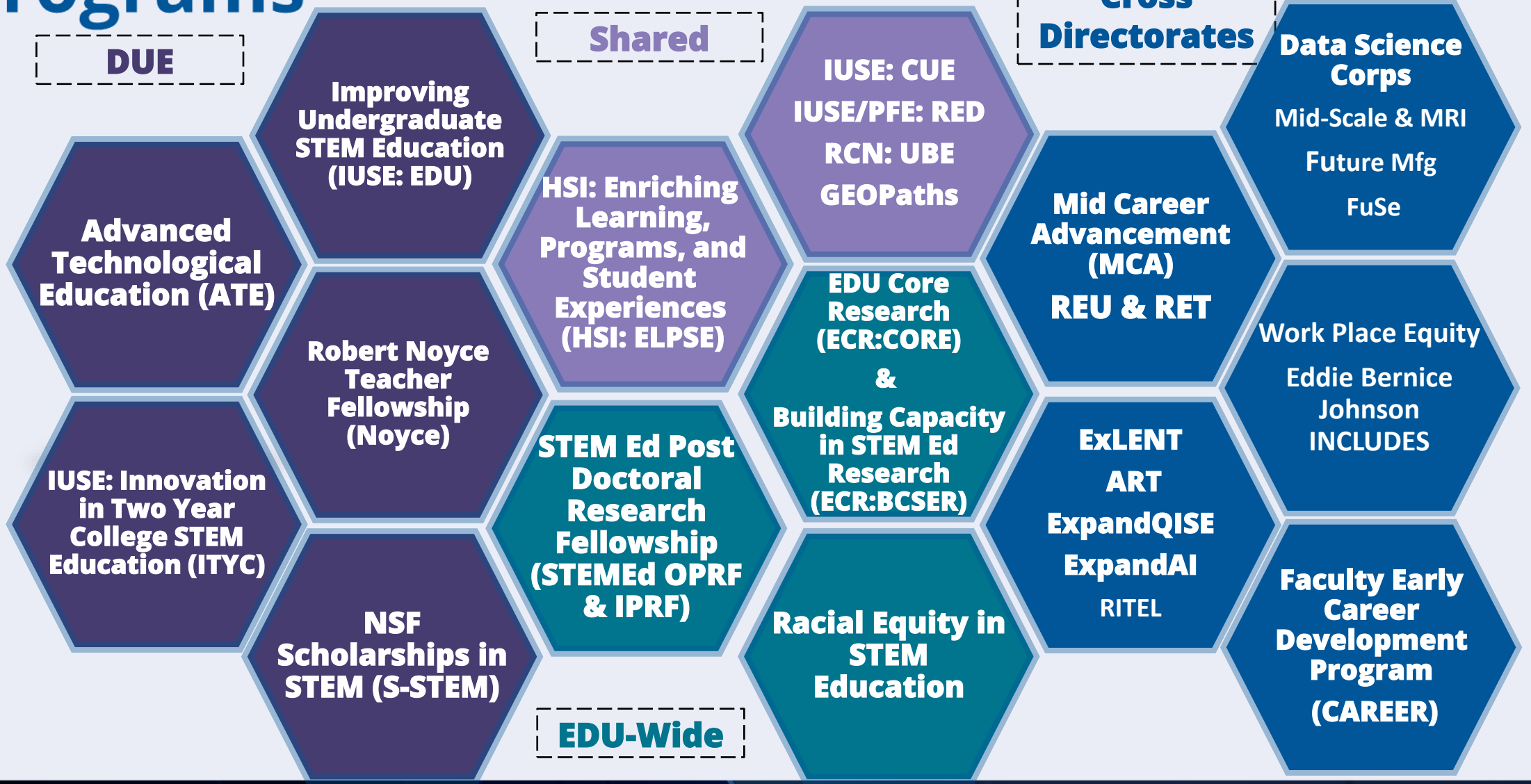
Preparing a diverse STEM workforce and a well-informed citizenry

EDU | DIRECTORATE FOR STEM EDUCATION

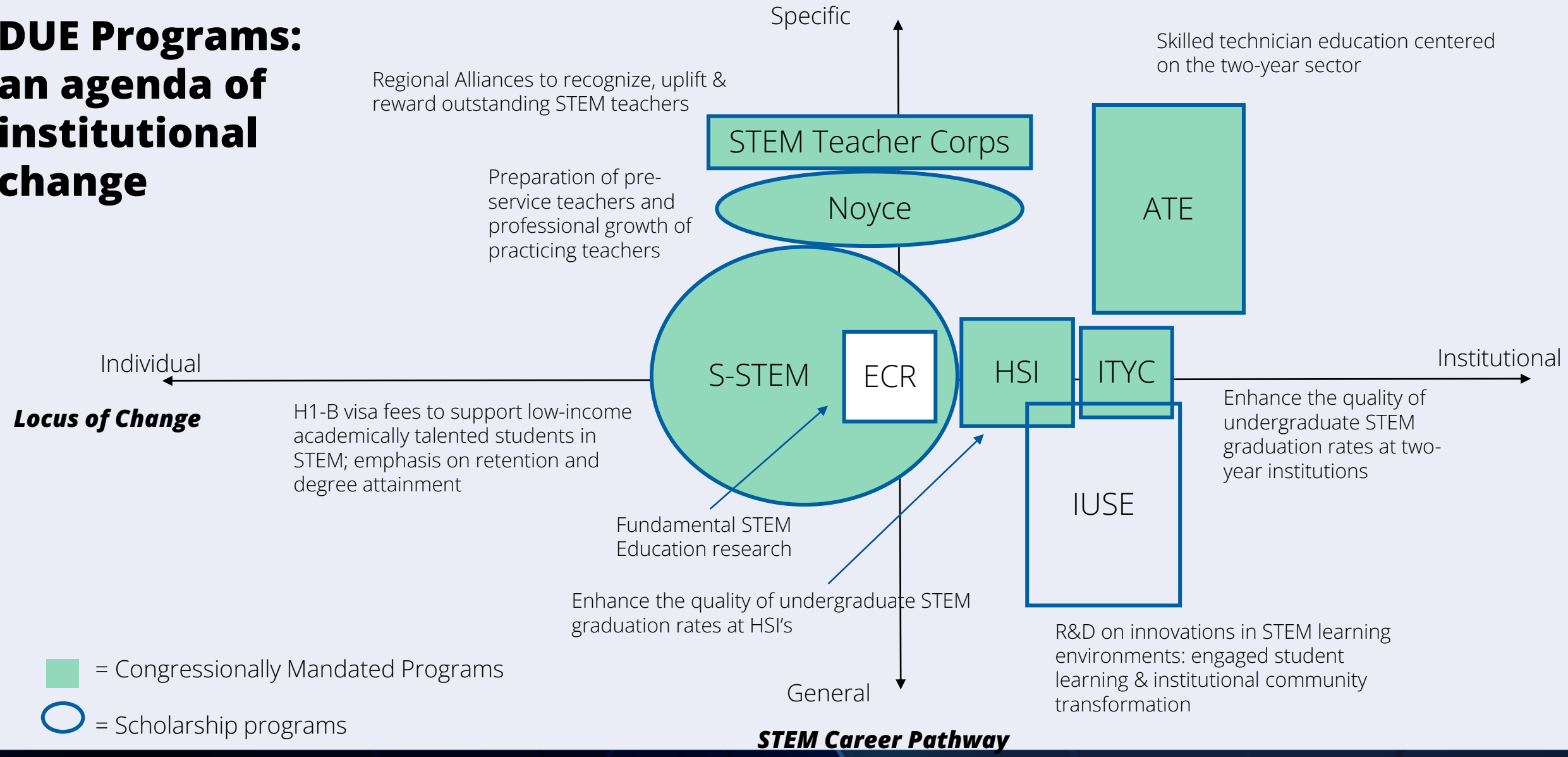
Division of Undergraduate Education (DUE)

Supports STEM education at two- and four-year colleges and universities by improving curricula, instruction, laboratories, infrastructure, assessment, diversity of students and faculty, and collaborations

DUE Programs



DUE Programs: an agenda of institutional change



DUE Rural Portfolio – *Overview*

DUE is currently supporting **410 active projects** with rural as a topic, within a rural (nonmetro) locale, or both (i.e., rural as a topic ***and*** within a rural locale).

178

DUE projects with rural as a topic

128

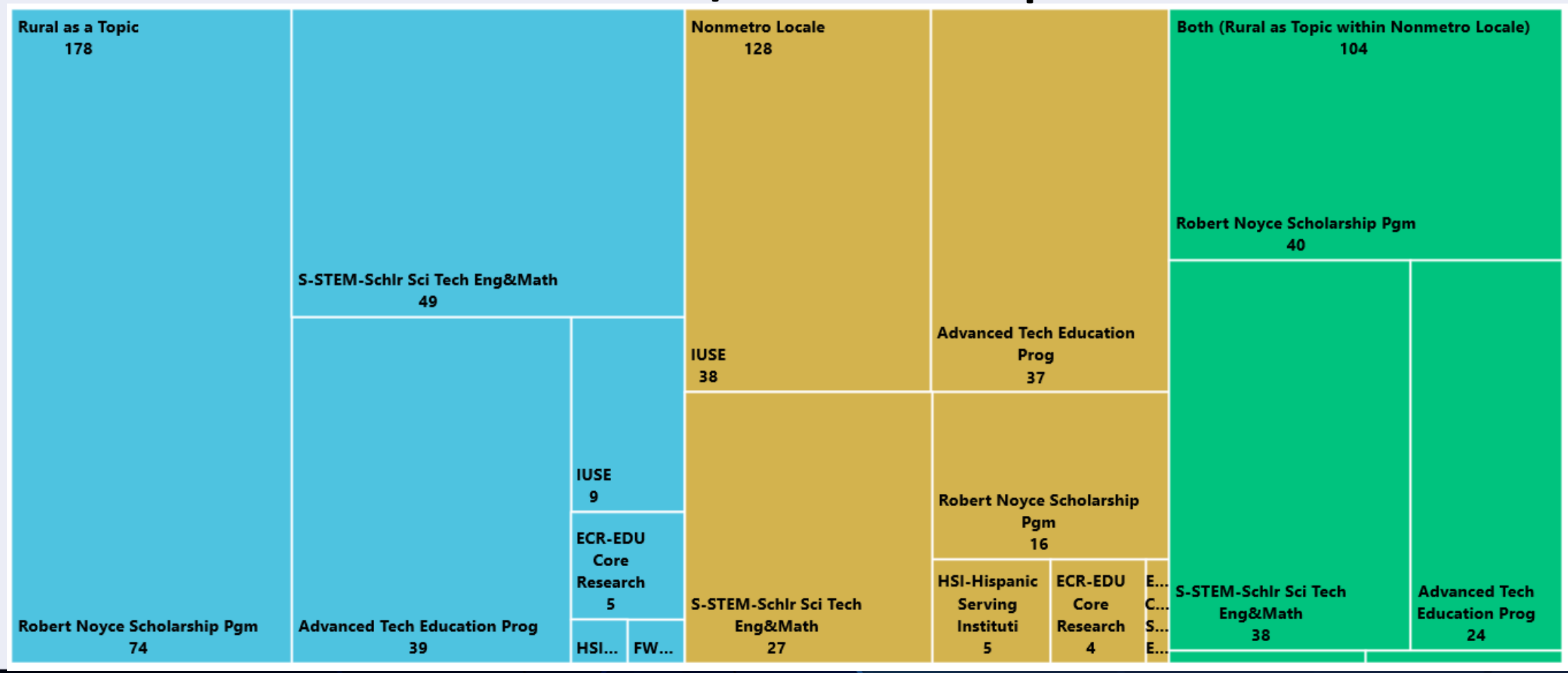
DUE projects within a rural locale

104

DUE projects with rural as a topic *and* within a rural locale

Division of Undergraduate Education (DUE)

Investments in nonmetro locales and/or on rural topics



Noyce Rural Strategy Exemplar

- Responsive to statute – US Code:
  - The term "high-need local educational agency (or high-need LEA)", as defined in section 201 of the Higher Education Act of 1965 (20 U.S.C. 1021), means a U.S. local educational agency (e.g., school district) that has at least one school that:
    - meets at least one of the following criteria:
      - not less than 20% of the children served by the agency are from low-income families;
      - serves at least 10,000 children from low-income families;
      - is eligible for funding under the Small, Rural School Achievement Program under 20 U.S.C. 7345(b); or
      - is eligible for funding under the Rural and Low-Income School Program under 20 U.S.C. 7351(b);
- Intentional outreach
- Cognizant of portfolio
- Recognizing the opportunity
- Understanding the community

Directorate for STEM Education (EDU)

The U.S. National Science Foundation's Directorate for STEM Education works to develop a well-informed citizenry and a diverse and capable workforce of scientists, technicians, engineers, mathematicians and educators

EDU Office of the Assistant Director (OAD)

- **Division of Graduate Education (DGE)**
- **Division of Equity for Excellence in STEM (EES)**
- **Division of Research on Learning in Formal and Informal Settings (DRL)**
- **Division of Undergraduate Education (DUE)**

EDU | DIRECTORATE FOR STEM EDUCATION

Division of Graduate Education (DGE) Rural Educational Portfolio

JACQUELINE HUNTOON, PHD
DIVISION DIRECTOR, DIVISION OF GRADUATE EDUCATION
EDU AC Meeting: May 29 – 30, 2024

EDU | DIRECTORATE FOR STEM EDUCATION

Division of Graduate Education (DGE)

DGE Mission: To enable and inspire an inclusive, equitable, and globally competitive U.S. STEM workforce by supporting students, research, scholarship, and innovations in graduate education.

DGE Vision: An inclusive, equitable, and globally competitive U.S. graduate education enterprise that advances STEM innovation, research, scholarship, diversity, and education.

A Cybersecurity Lab at Old Dominion University from SFS Award 2042882
Credit: Corey Nolen Photo, Old Dominion University.

EDU | DIRECTORATE FOR STEM EDUCATION

Programs Managed Primarily by DGE

CyberCorps® Scholarship for Service Program (SFS) Increase number and diversity of qualified cybersecurity professionals prepared to serve the cybersecurity mission of government. **Secure & Trustworthy Cyberspace, Education (SaTC EDU)** Advance research on cybersecurity learning, pedagogy, equity, and inclusion.

Graduate Research Fellowship Program (GRFP) Support outstanding graduate students as they prepare to serve as the nation's future STEM scholars and leaders.

NSF Research Traineeship Program (NRT) Prepare diverse cohorts for a range of careers in high-priority interdisciplinary or convergent research areas. **Innovations in Graduate Education Program (IGE)** Encourage bold and potentially transformative approaches to STEM graduate education and training.

STEM Education Postdoctoral Research Fellowships (STEM Ed PRF) Program Build capacity to conduct STEM education research by funding early-career scholars.

Others Contributed to by DGE

EDU Core Research (ECR:Core) + EDU Core Research: Building Capacity in STEM Education Research (ECR:BCSER)

Racial Equity in STEM Education (EDU Racial Equity)

DGE Rural Portfolio – ***Overview***

DGE currently supports **50 active projects** with rural as a topic, within a rural (nonmetro) locale, or both (i.e., rural as a topic *and* within a rural locale). This is **out of a total of 511 active awards**. **GRFP was excluded** from the analysis because the fellowships are portable.

19

DGE projects with rural as a topic

30

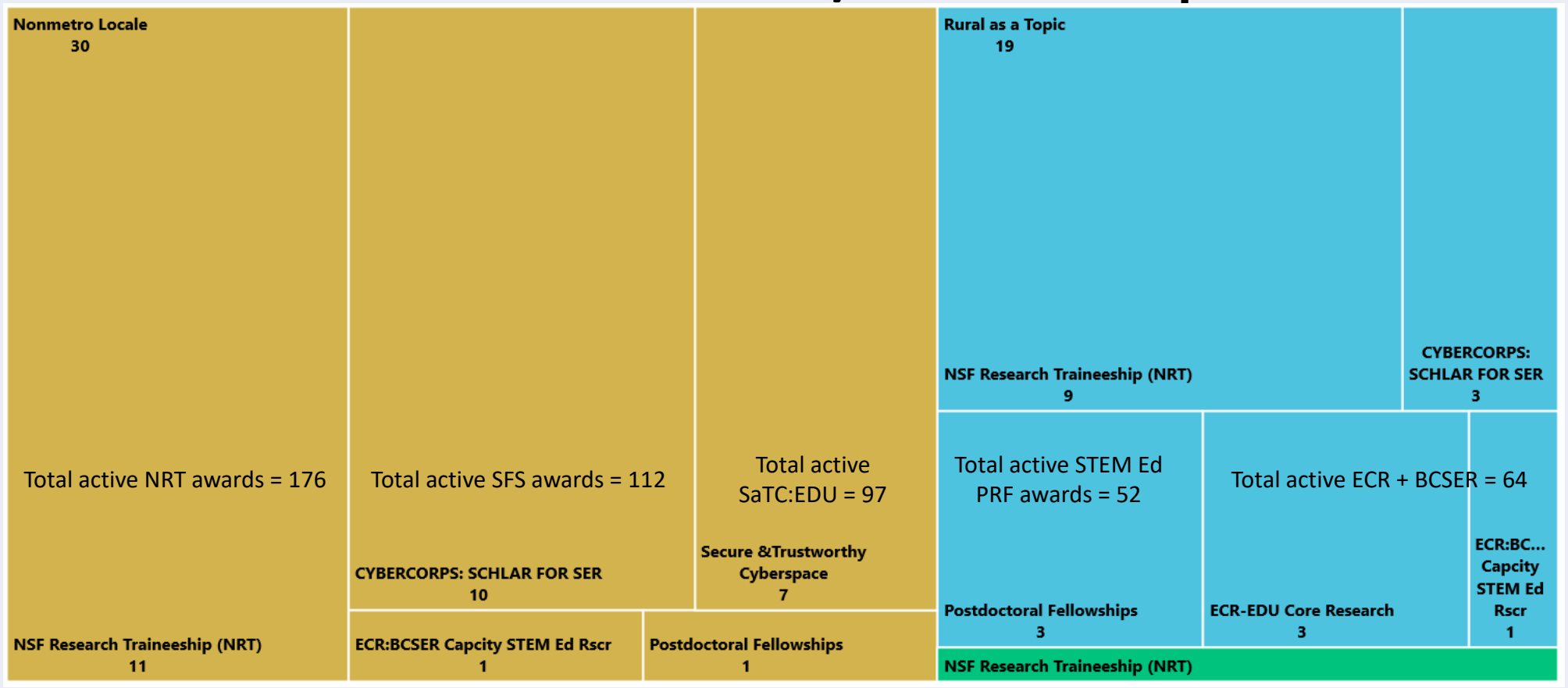
DGE projects within a rural locale

1

DGE projects with rural as a topic *and* within a rural locale

Division of Graduate Education (DGE)

Investments in nonmetro locales and/or on rural topics



SFS Example

NSF Award *#1921726*

Dakota State University Madison, SD

This Cybercorps® SFS program has had a 100% job placement rate for graduates.

Questions?

Session 5 Discussion Questions

1. In thinking about this session, what is the most notable?

2. Is there anything you were hoping to hear but didn't?

3. Earlier, you were asked what "success" would look like in Rural STEM Education and Workforce Development, has that definition changed over the last five sessions? Please clarify.

SESSION 6: Pulling it all Together to Unleash Opportunities in STEM Education

Session 6 Discussion Questions

1. What are some common themes you heard regarding approaches to Rural STEM Education and Workforce Development?
2. As we think about creating opportunities everywhere, are there any unique approaches that EDU might want to consider when engaging and advancing STEM Education in rural and remote environments?
3. Given what you heard in your breakout groups and in this discussion, what recommendations for prioritizing efforts could you provide?

Preparation for Meeting with NSF Chief Operating Officer
11:30 a.m. – 12:00 noon

LUNCH and BREAK: 12:45 noon – 1:15 p.m.

Meet with NSF Chief Operating Officer and Chief of Staff
1 – 1:30 p.m.

Thank you!