Power of Data Project Builds Bridges to Geospatial Inquiry across the Nation

Lori Rubino-Hare

Mark Manone

NORTHERN ARIZONA UNIVERSITY | College of Engineering, Forestry, and Natural Sciences

Center for Science Teaching and Learning

Geospatial Research and Information Laboratory

Special Achievement in GIS 2015 Award Winner

NSF DRL #1513287

What is the Power of Data?

A 35-hour professional development program that helps secondary teachers enhance existing lessons with Geospatial Inquiry.

Teachers engage in adult-level science-focused Geospatial Inquiry as learners and reflect.

Teachers develop similar Geospatial Inquiry for students in their specific content.

Offered by 28 Facilitators in 18 states and DC

POWER of DATA
pod-stem.org

DRL 1513287

Design Principles

Geospatial Inquiry:

- is used for a **purpose** (answer, explanation, solution).
- is **socially constructed**.
- promotes **cross-disciplinary practices** and **21st century skills**.
- is **iterative and sequenced over time** and employs technological and communication **scaffolds** to promote **conceptual understanding** of big disciplinary ideas.
- uses geospatial technologies as **tools** (patterns, evidence)
- is a **reflective practice**.

Engaging in Geospatial Inquiry and seeing how it is used by professionals provides inspiration to enter **STEM careers**.

Goals for Teachers

- Increase **understanding** of Geospatial Inquiry
- Increase **confidence and skills** for facilitating Geospatial Inquiry with students
- Identify opportunities to implement Geospatial Inquiry to **enhance student learning** of key disciplinary concepts
- Increase awareness of **careers** that could inspire students to enter STEM fields

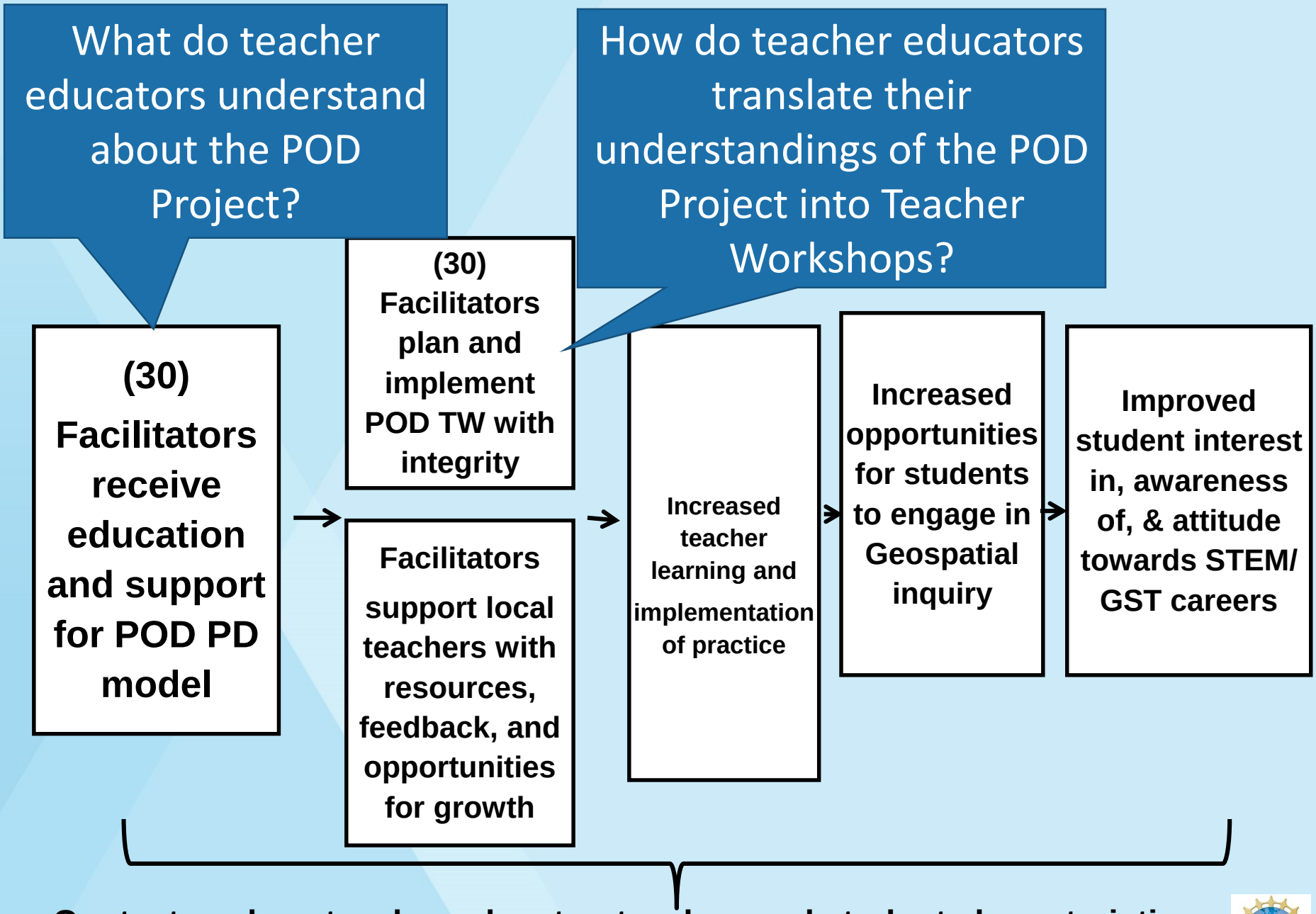
Components

Agenda for 35 Hour POD Teacher Workshop

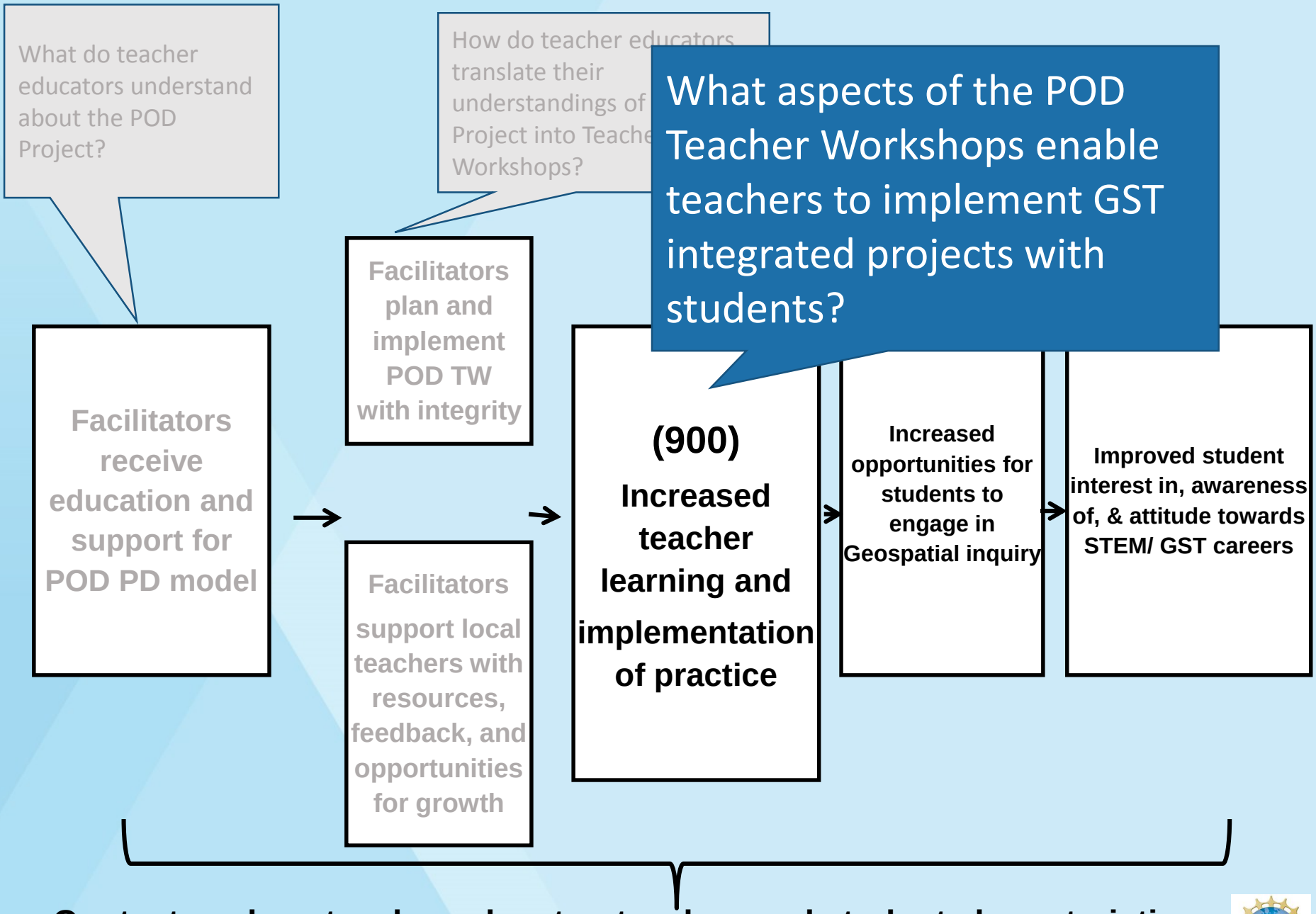
Session 1	Intro to POD	GST Pre Assessment	Geospatial Inquiry	Pedagogical Moves	Geospatial Inquiry	Metacognition, Evaluation, & Homework
Session 2	Geospatial Inquiry	Designing a Geospatial Inquiry		Career Spotlight		Metacognition, Evaluation, & Homework
Session 3	Geospatial Inquiry	Implications for Teaching with Geospatial Inquiry	Career Spotlight	Designing a Geospatial Inquiry	Pedagogical Moves	Metacognition, Evaluation, & Homework
Session 4	Geospatial Inquiry	Implications for Teaching with Geospatial Inquiry	Career Spotlight	Pedagogical Moves	Designing a Geospatial Inquiry	Metacognition & Evaluation
Sessions	Implications for Teaching with Geospatial Inquiry	POD Research Overview	Designing a Geospatial Inquiry	Celebration	GST Post Assessment	Workshop Evaluation

POWER of DATA

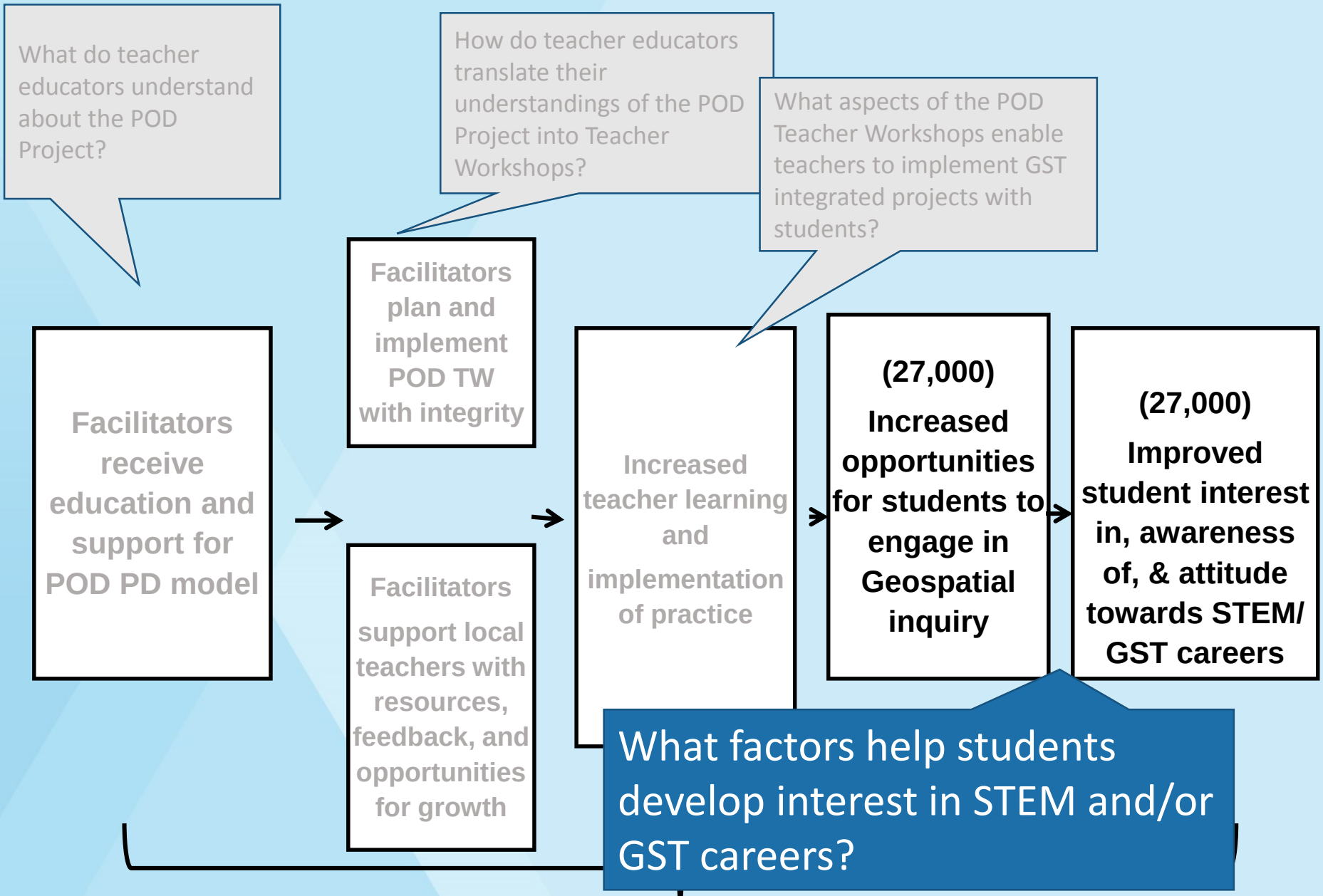
pod-stem.org


What do teacher educators understand about the POD Project?
How do teacher educators translate their understandings of the POD Project into Teacher Workshops?
(30) Facilitators receive education and support for POD PD model
(30) Facilitators plan and implement POD TW with integrity
Facilitators support local teachers with resources, feedback, and opportunities for growth
Increased teacher learning and implementation of practice
Increased opportunities for students to engage in Geospatial inquiry
Improved student interest in, awareness of, & attitude towards STEM/ GST careers
Context such as teacher educator, teacher, and student characteristics, curriculum, policy and working environment

DRL 1513287


What do teacher educators understand about the POD Project?
How do teacher educators translate their understandings of Project into Teache Workshops?
What aspects of the POD Teacher Workshops enable teachers to implement GST integrated projects with students?
Facilitators receive education and support for POD PD model
Facilitators plan and implement POD TW with integrity
Facilitators support local teachers with resources, feedback, and opportunities for growth
(900) Increased teacher learning and implementation of practice
Increased opportunities for students to engage in Geospatial inquiry
Improved student interest in, awareness of, & attitude towards STEM/ GST careers
Context such as teacher educator, teacher, and student characteristics, curriculum, policy and working environment

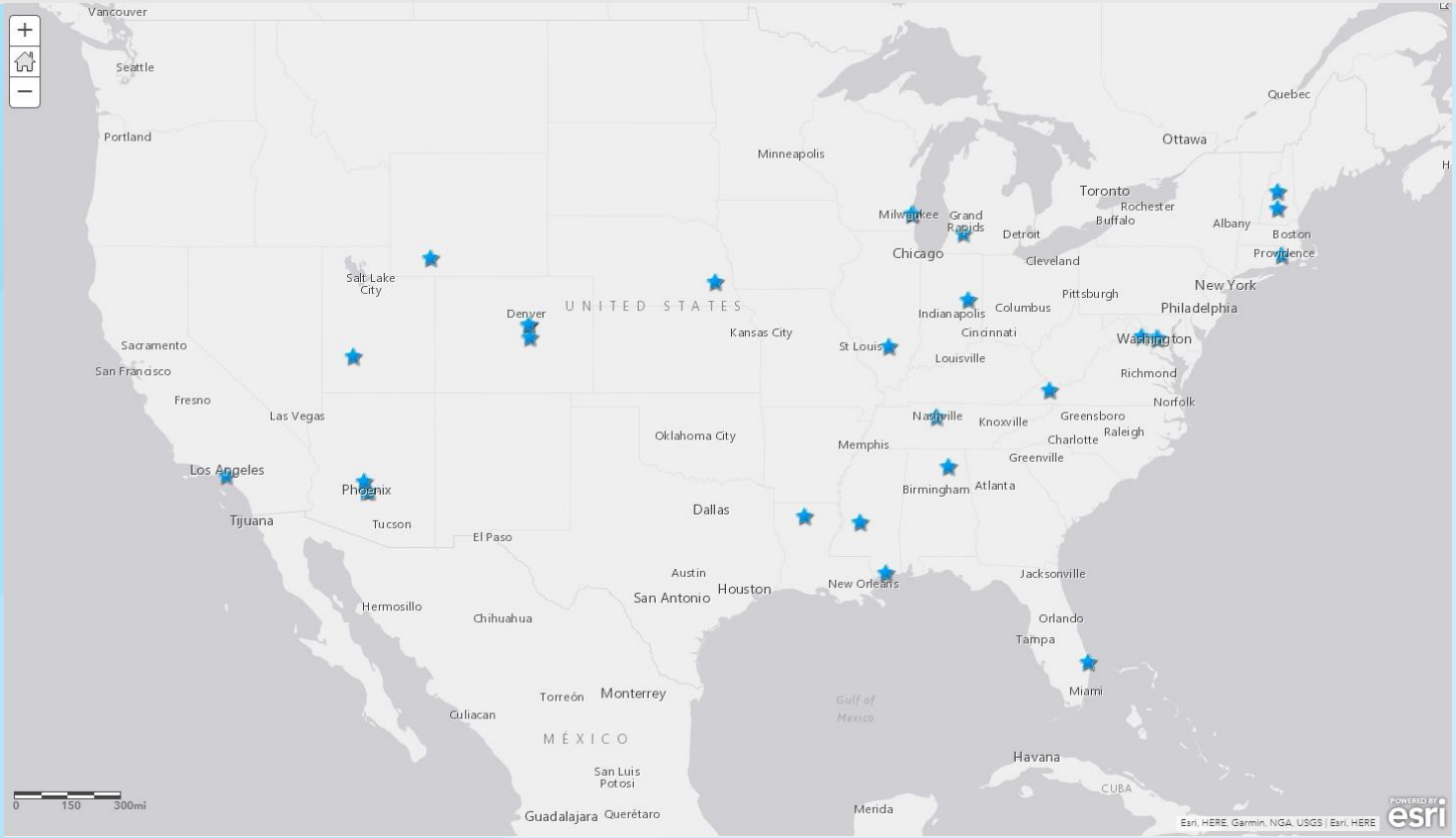
DRL 1513287


What do teacher educators understand about the POD Project?
How do teacher educators translate their understandings of the POD Project into Teacher Workshops?
What aspects of the POD Teacher Workshops enable teachers to implement GST integrated projects with students?
Facilitators receive education and support for POD PD model
Facilitators plan and implement POD TW with integrity
Facilitators support local teachers with resources, feedback, and opportunities for growth
Increased teacher learning and implementation of practice
(27,000) Increased opportunities for students to engage in Geospatial inquiry
(27,000) Improved student interest in, awareness of, & attitude towards STEM/ GST careers
What factors help students develop interest in STEM and/or GST careers?
Context such as teacher educator, teacher, and student characteristics, curriculum, policy and working environment

DRL 1513287

Progress

- 28 Facilitators
- 19 Teacher Workshops
- 156 teachers
- 7 Teacher Workshops in progress
- 471 students



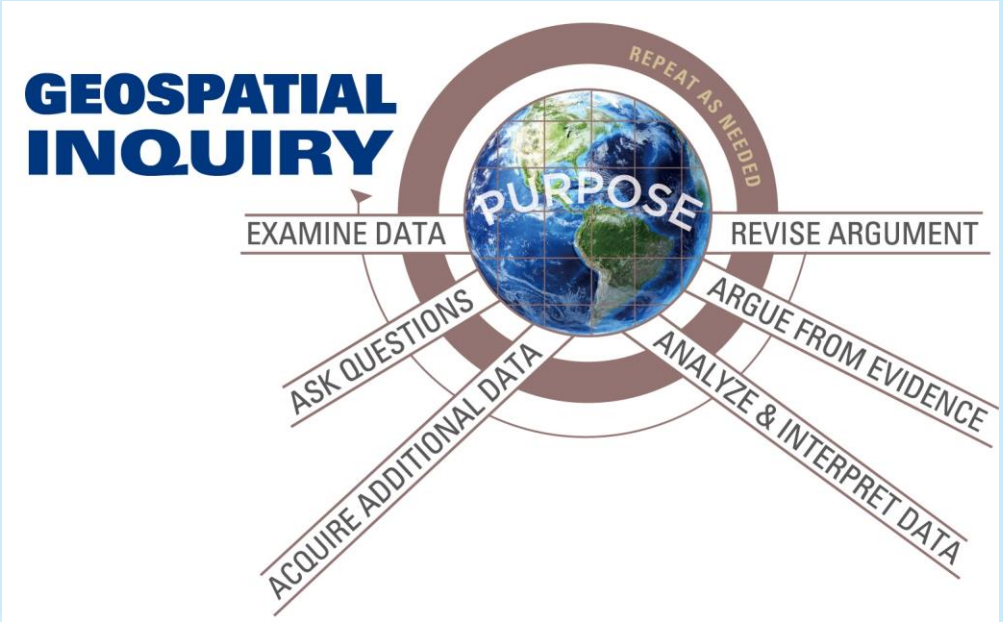
POWER of DATA
pod-stem.org

Teacher Supports

Geospatial Analysis Framework

(Mitchell, 1999)

1. Examining where things are
2. Examining most and least
3. Finding areas of concentration
4. Finding what's inside
5. Finding what's nearby
6. Examining change over time



POWER of DATA

pod-stem.org

Geospatial Inquiry Lesson Plan Template

Begin with the End in Mind – Big idea

Ask Questions – Guiding question

Geospatial Analyses and Data

Evidence of Student Learning
(diagnostic, formative, summative)

Quality of Evidence/Criteria for Exemplary Performance

Examine Geospatial Data

Map the Geospatial Inquiry

Activity	Learning Goal	How it helps students address the guiding question

Scaffolds (participation, communication, technology)

POWER of DATA
pod-stem.org

Guiding Questions from Teachers

- What are risks that contribute to the contamination of groundwater?
- Is there any correlation: locations of mosquito-borne illness and range of specific species? Specific natural disasters and an increased incidence of mosquito-borne illness?
- How will you be affected if the New Madrid fault reactivates with similar energy to the 1811-12 events?
- How can archaeologists utilize GIS to locate possible sites of historical and cultural interest for exploration?
- Which locations/features within the Panama Canal Construction Zone best represent the challenges the US overcame to successfully build it?
- Where is the world's population distributed? How can we tell? Why is this important?

Tips – Teaching with GIS

- Videos, tutorials for future reference
- Experience as adult learners first – multiple times – then apply it to classroom
- Expect technology glitches

- Feedback – early and often..scale, realistic
- Hack Esri GeoInquiries
- Data buckets
- Teams of facilitators recommended (pedagogy and GST)

POWER of DATA
pod-stem.org

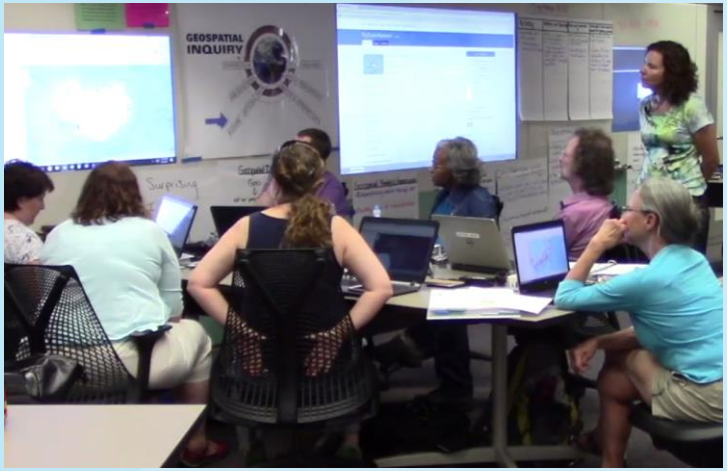
Lessons from POD Facilitators

- Face to face cannot be replaced
- TIME to explore, generate lessons, talk
- Local data, local issues
- Less tech is more (AGOL)
- Provide examples of rubrics, products

- Pedagogy + Technology = mixed reviews
- Multiple rounds of Geospatial Inquiry, more varied examples
- Differentiated instruction for teachers

POWER of DATA
pod-stem.org

Thank You



Lori.Hare@nau.edu

Mark.Manone@nau.edu

Special thanks:

- POD Facilitators - Esri/T3G/Fitzpatrick
- POD Teachers - GISetc
- Co-PIs (Bloom, Palmer, Sample, Whitworth)
- Advisors (Baker, Cunningham, Daehler, Yanow)
- NSF ITEST
- Horizon Research, Inc.