EASE | EXCELLENCE AWARDS IN SCIENCE AND ENGINEERING

EDUCATION AND HUMAN RESOURCES
DIVISION OF HUMAN RESOURCE DEVELOPMENT

ASPIRING TO LEAD:
A REPORT FROM THE AAPT PHYSICS MASTER TEACHER LEADER TASKFORCE

OCTOBER 18, 2017 | 1:00PM - 2:00PM | C 2010

SPEAKER

Rebecca Vieyra
K 12 Program Manager
PAEMST 2013,
7 12 SCIENCE, IL

JOINED BY:

MIKE MANGIARACINA
PAEMST 2014,
K-5 Science, DC

JEFF MILBOURNE, Ph.D.
PAEMST 2013,
7 12 Science, NC
Einstein Fellow on
Capitol Hill

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PHYSICS EDUCATION

Aspiring to Lead

Rebecca Vieyra PAEMST (2013), K-12 Program Manager, AAPT
Mike Mangiaracina PAEMST (2014), K-5 STEM Specialist, DCPS
Jeff Milbourne PAEMST (2013), Former advisor to U.S. Rep. Honda

Joining Virtually…

Josh Underwood

PAEMST (2011), KY, Deming School

Scot Hovan

PAEMST (2007), MN, Mahtomedi High School

Remy Dou

AEF (2011-2013),
Florida International University,
STEM Transformation Institute

Brandon Helding

Boulder Learning, Inc.

Aspiring to Lead

A report from the AAPT Physics Master Teacher Leader Taskforce

Engaging K-12 teachers as agents of national change in physics education.

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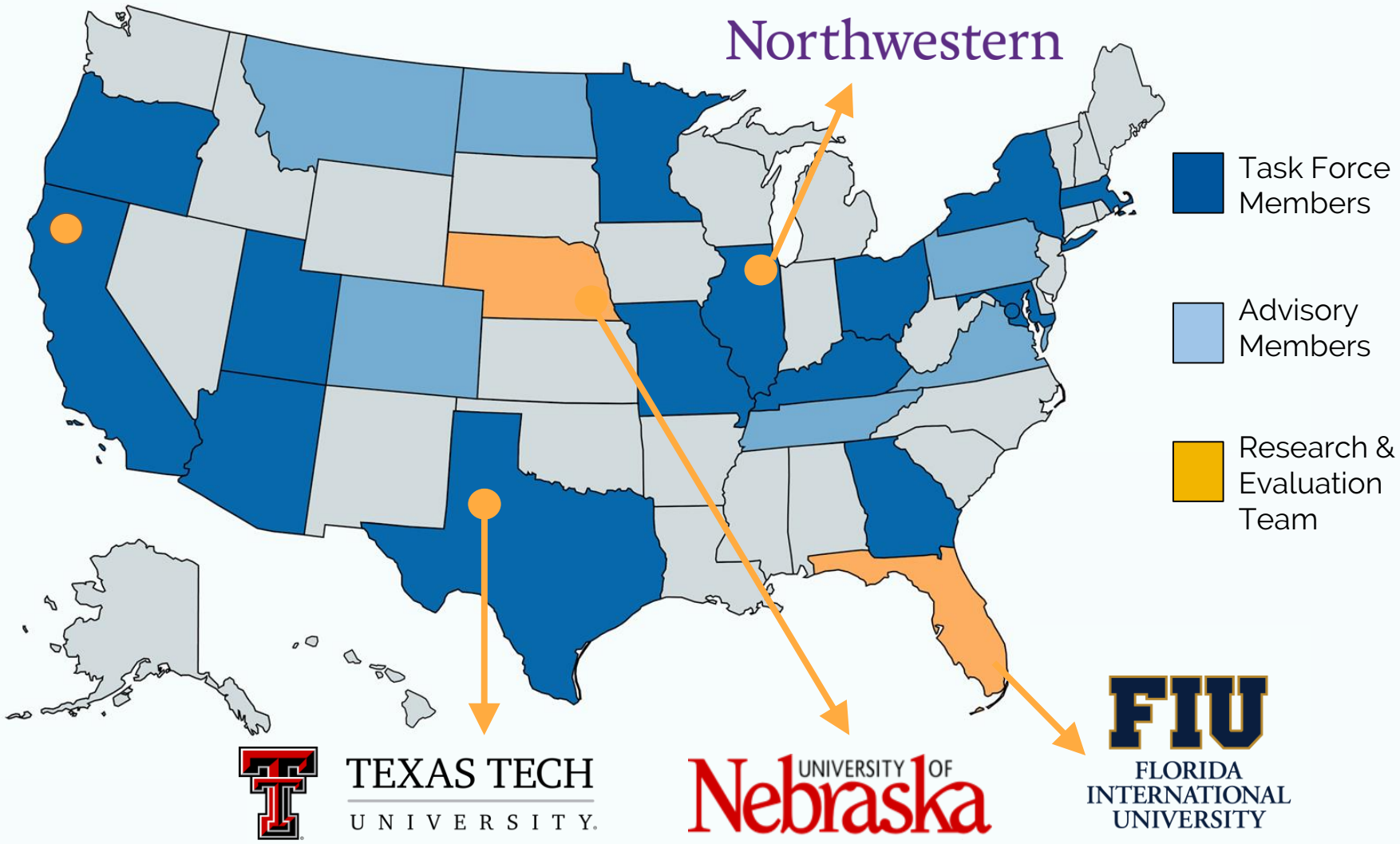
PAEMST Awardees

43 Total Teachers Involved



Science Education Reform

National
- Every Student Succeeds Act (ESSA)

State
- Teacher preparation
- Student assessment

District
- Teacher professional development
- Teacher evaluation
- Curriculum
- Instructional Approach

Classroom
- Teacher beliefs about purpose of science education
- Teacher self-efficacy

Science Education Reform

Teacher leadership is missing from the science education system and policy reform conversations.

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Needs

What **our nation needs** from teachers…

- Persistence
- High quality science teaching
- High quality science teacher leadership

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What **our teachers need** from the nation…

- High quality teacher preparation
- Sustained support for growth
- Recognition of teacher professional expertise
- Opportunities and invitations to be involved in decision-making about education at all levels

Needs

What **our nation needs** from teachers…

- Persistence
- High quality science teaching
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What **our teachers need** from the nation…

- High quality teacher preparation
- Sustained support for growth
- Recognition of teacher professional expertise
- Opportunities and invitations to be involved in decision-making about education at all levels

How can the nation and the nation's STEM teachers support each other?

Teachers need situated leadership support.

Goals

Systematically identify, develop, empower, and coordinate teacher leadership to improve curriculum & instruction, and inform education policy in K-12 physics and physical sciences.

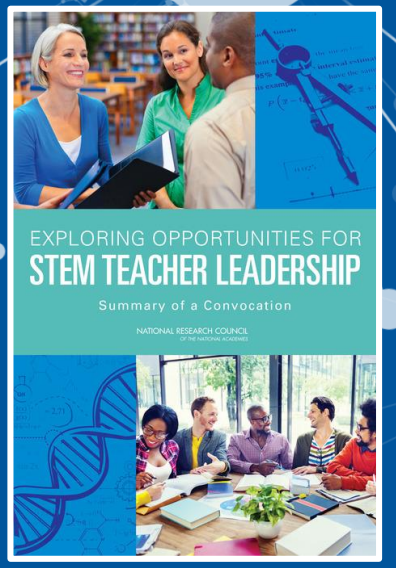
Build a model for K-12 physics education teacher leadership applicable to other disciplines.

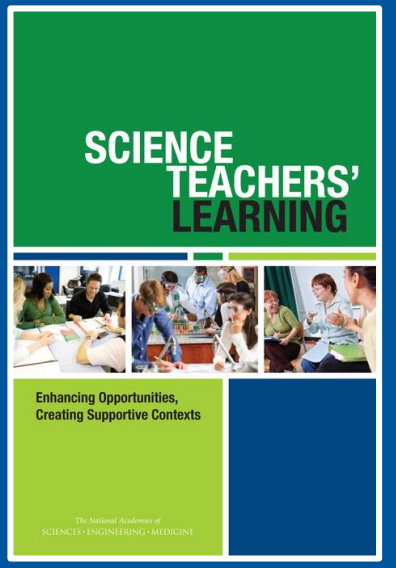
AAPT PHYSICS EDUCATION

Major Research Gaps

How can the nation and the nation's STEM teachers support each other?

- Few opportunities for STEM teacher leadership exist (NAS, 2014).
- Teachers need situated leadership training (NASEM, 2015, pg. 200).
- The "research base on teacher leadership is not robust" (Ibid, pg. 196).

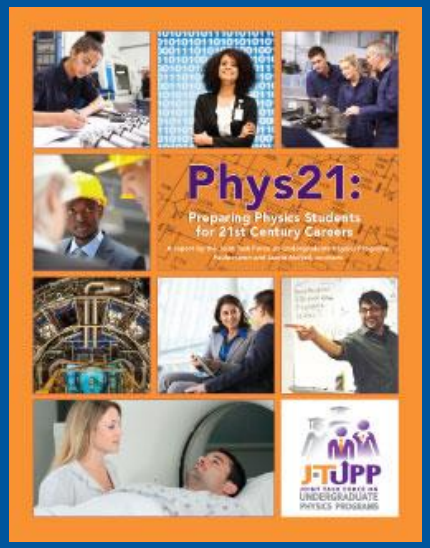




NSF's Broader Impacts

NSF has had perhaps a greater impact on science education in the past 67 years than any other institution, agency, or policy.

NSF has supported physics and physics education, serving as the platform for science education around the world.



Physics Teacher Education Coalition

Improving the Education of Future Physics Teachers

J·TJPP

JOINT TASK FORCE ON UNDERGRADUATE PHYSICS PROGRAMS

PhysPort

Supporting physics teaching with research-based resources

workshop for new physics and astronomy faculty

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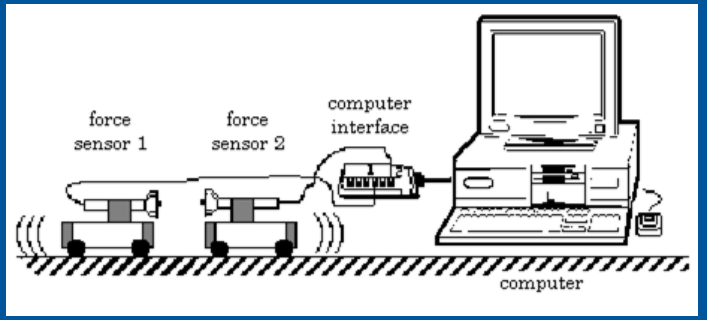
Curricular Reform



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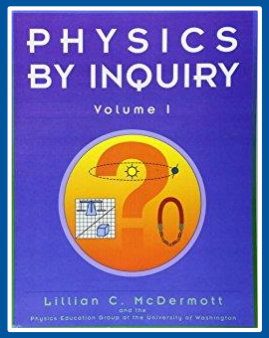
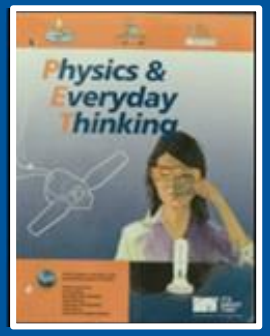
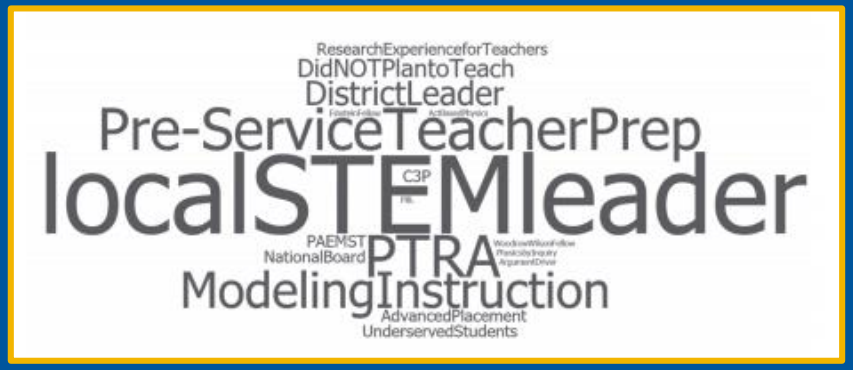
PER / DBER

PUM





PhET
INTERACTIVE SIMULATIONS



AAPT PTRA
American Association of Physics Teachers
Physics Teaching Resource Agents

AMTA
American Modeling Teachers Association

One Project, Three Programs

Physics Master Teacher Leader Project

Principle

PD&L programs must build strong **Networks and Community** characterized by:

- PD&L “for teachers, by teachers,”
- Support across the career spectrum, and
- Participation from K-12 teachers, higher education faculty, and professional associations for educators.

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Priorities

Mentoring & Induction
(secondary)

Vertical Alignment
(K-12)

Program Support & Advocacy
(K-12)

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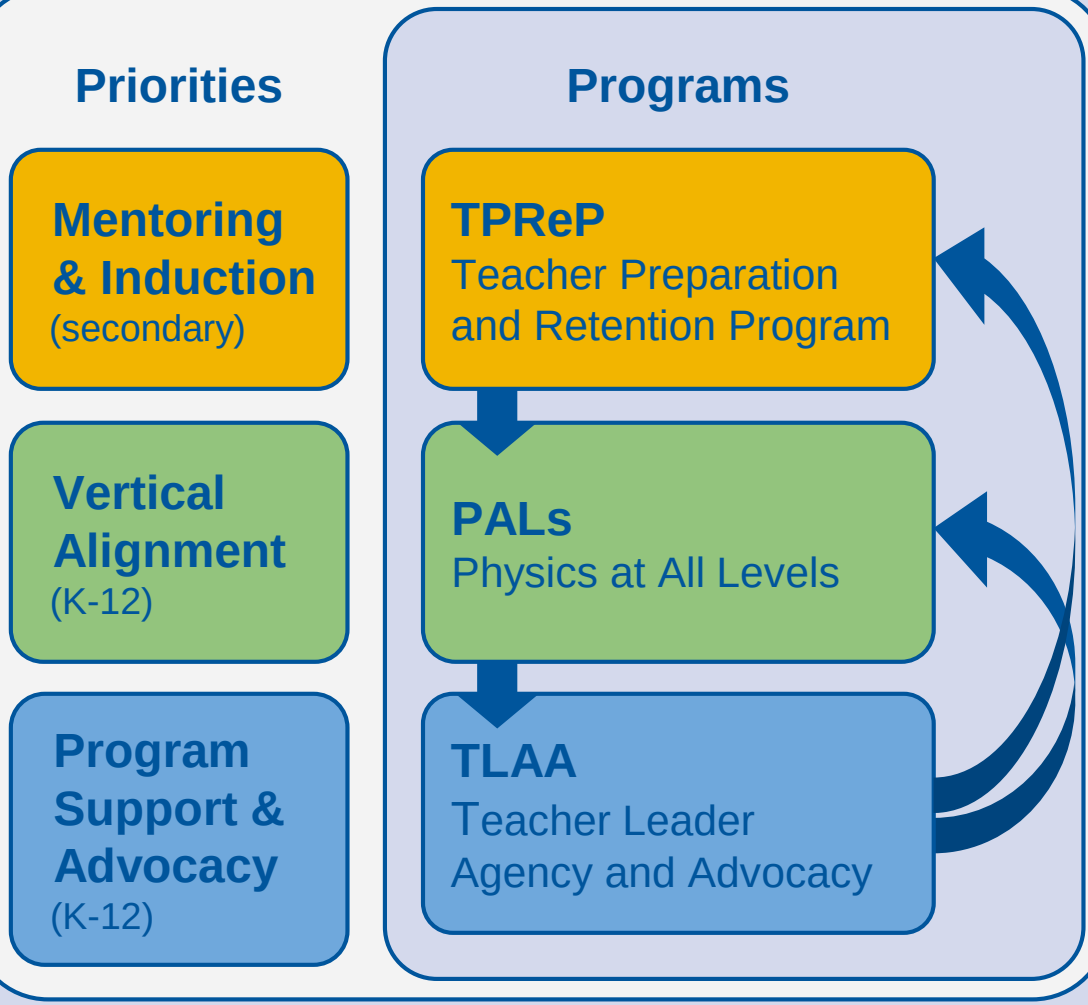

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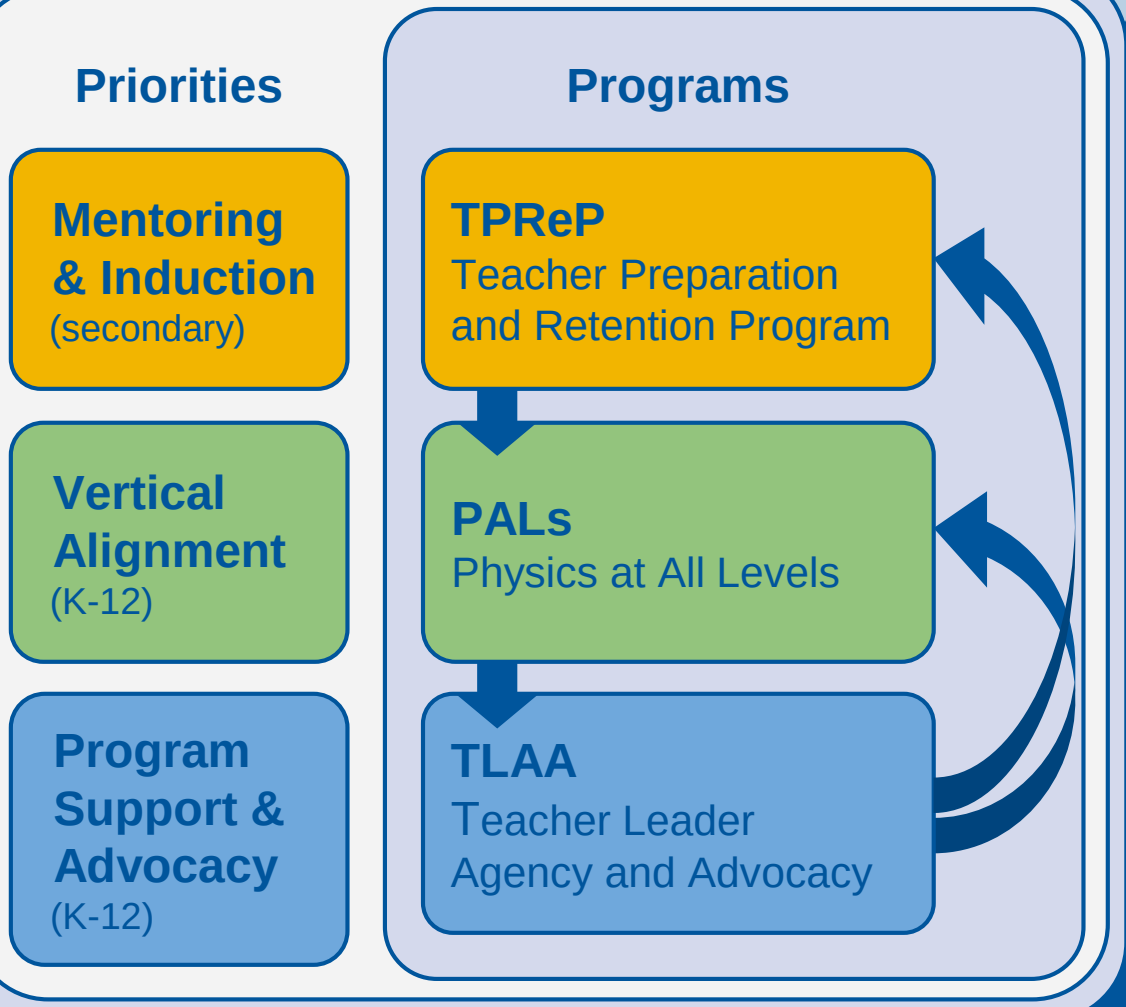

	Emerging	Transforming
Instructional Leadership Performance Indicators		
Broad Mindsets		

- Their pedagogi… knowledge is o…
- They actively s… pedagogical co… through reflecti…
- They learn abo… research-based… practices for ot…
- They mentor n…
- They attend, pl… professional de… teachers.
- They participat… learning comm… ideas through f… interactions (de… meetings, work… mentoring) and… publications, w… curriculum deve…
- They move coll… groups (professional learning communities) towards impactful changes in their teacher practice (leading with confidence as opposed to merely sharing).
- They advocate for teacher leadership opportunities.
- They advocate for science education for all students.
- They integrate student-relevant and appropriate cross-disciplinary topics into science education.
- They seek and are aware of financial, technological, curricular, and instructional resources that support their teaching.

	Emerging	Transforming
Association Leadership Performance Indicators		
Broad Mindsets		

- They look for opp… others in the asso…
- They work in orde… succeed, not just … own classrooms.
- They use the asso… engage the comm… through a magnifi…
- They are strategic… improve the work… just to maintain st…

	Emerging	Transforming
	Policy Leadership Performance Indicators	
Broad Mindsets and Beliefs • They understand that policy is the regulation and allocation (and reallocation) of resources. • They understand how to translate best practices from their classrooms into viable policy solutions (or, conversely, use policy to solve problems that exist in their classrooms). • They understand how to effectively advocate for good policy solutions. • They understand the interplay between policy and politics, and understand how to navigate situations that require one, the other, or both. • They have a strong network of professional contacts that can help them accomplish their policy/advocacy goals. • They are comfortable engaging with legislators and are willing to invite policy makers into their classroom (in-person or through videos, interviews, and anecdotes) to provide firsthand experiences of master teachers. • They understand both current policy as well as the way this policy came to be and the issues it intended to address. • They recognize that policy change is an iterative, long-term process that often includes obstacles such as setbacks due to inappropriate timing, audience, etc.	**Local**	• Understands the context of and implements local policy to the benefit of the education of students. • Identifies local policy and the difficulties (struggles, issues) that appear in the classroom as a result of "bad" policy. • Identifies local point persons who are levers for policy change (department chair, principal, superintendent, board members, colleagues). • Maintains an open-door classroom to keep a two-way conversation with policy makers.	• Influences and supports others to implement local policy to the benefit of the education of students. • Takes steps toward influencing departmental/school-wide policies. • Makes new opportunities and invites other teachers to join in local policy leadership. • Invites policy makers into the classroom to understand the impact of policy on education.
	State	• Understands the context of and implements state policy. • Identifies state policy and the difficulties (struggles, issues) that appear in the classroom as a result of "bad" policy. • Identifies state-level point persons who are levers for policy change (State Board of Education, state science supervisors, etc.).	• Influences and supports others to implement state policy. • Takes steps toward influencing district and state policies (including policies of state-level and advocacy organizations). • Makes new opportunities and invites other teachers to join in state policy leadership.
	National	• Understands the context of and implements national/federal policy. • Identifies national policy and the difficulties (struggles, issues) that appear in the classroom as a result of "bad" policy. • Identifies national/federal-level point persons and agencies that are levers for policy change (Department of Education, National Science Foundation, etc.).	• Influences and supports others to implement national/federal policy. • Takes steps toward influencing national/federal policies (including policies of national advocacy organizations like NSTA or AAPT). • Makes new opportunities and invites other teachers to join in national-federal policy leadership.
	Attitudes and Skills	• Recognizes that educational policy is more than legislation, and results in implementation (i.e. school/district rules, curricular guidelines, standards, assessments, union rules, and historical tendencies). • Recognizes other teachers who are policy leaders. • Knows how to shift from problem-focused to solution-focused thinking in regard to policy. • Recognizes that teacher voice is both necessary and credible in policy discussions.	• Engages in policy work alongside teachers who have experience in policy leadership (as a support to others, and then later as a guide to others). • Generates ideas through innovative thinking about policy, and to share those ideas with stakeholders. • Makes new pathways for teacher voice in policy discussions directly and/or with support of advocates.

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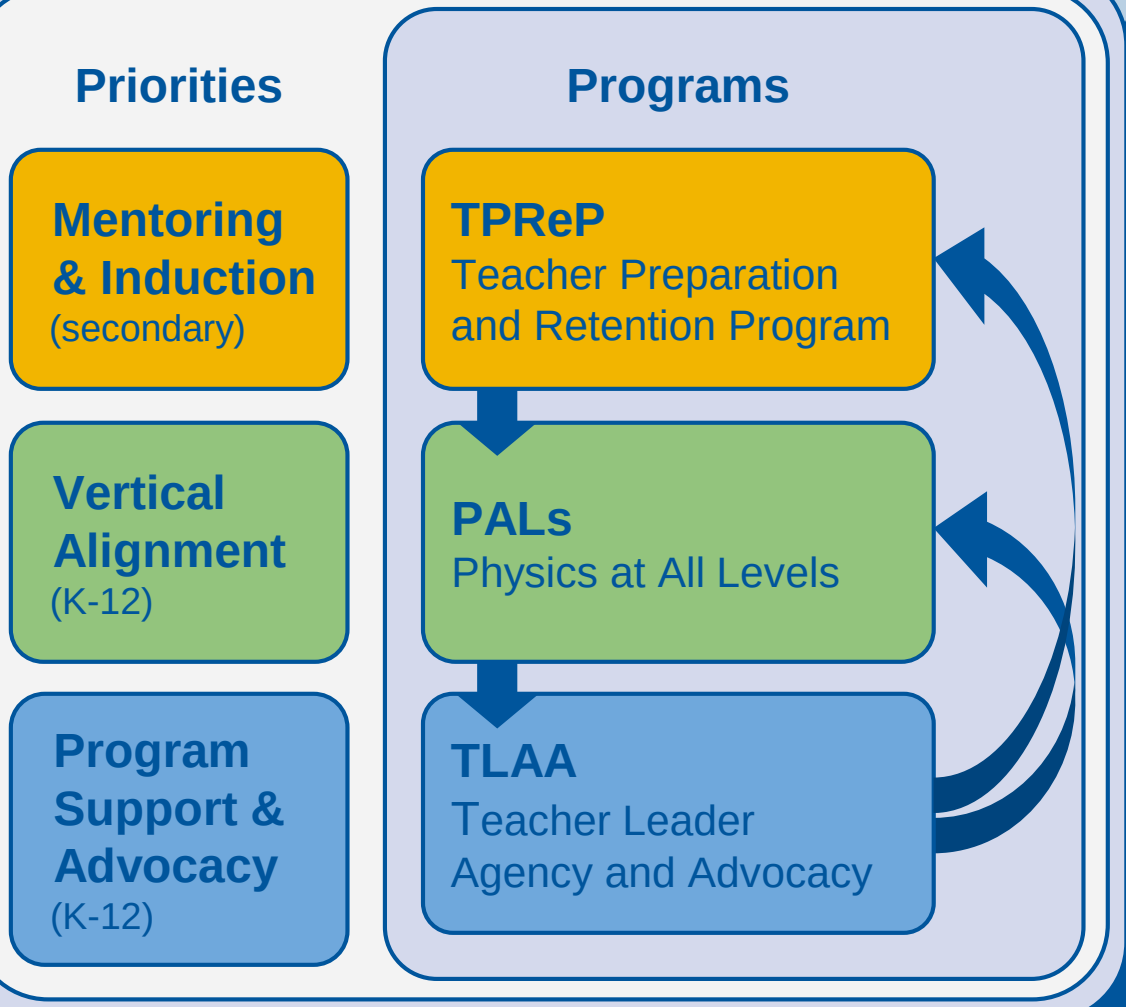

One Project, Three Programs

Physics Master Teacher Leader Project

Retention

Teacher Preparation and Retention Program

Audience/Format

- PhysTEC graduates and master teachers (paired)
- Multi-year cohort

Elements

- Mentoring by master
- Implementation of research-based, discipline-specific teaching strategies
- Induction into physics education community
- **Instructional leadership activities**

Alignment

Physics at All Levels

Audience/Format

- K-6 and 7-12 teachers (paired)
- Multi-year cohort

Elements

- Mentoring by peers
- Implementation of research-based, discipline-specific teaching strategies
- Induction into physics education community
- **Association/Instructional Leadership activities**

Advocacy

Teacher Leader Agency and Advocacy

Audience/Format

- K-12 teachers (state-based cohorts)
- Multi-year cohort

Elements

- DC-based policy training
- State-level and/or local advocacy work
- Support of K-12 physics education teacher leadership programs
- **Policy Leadership activities**

Science Education Reform

Teacher leadership is missing from the science education system and policy reform conversations.

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Classroom
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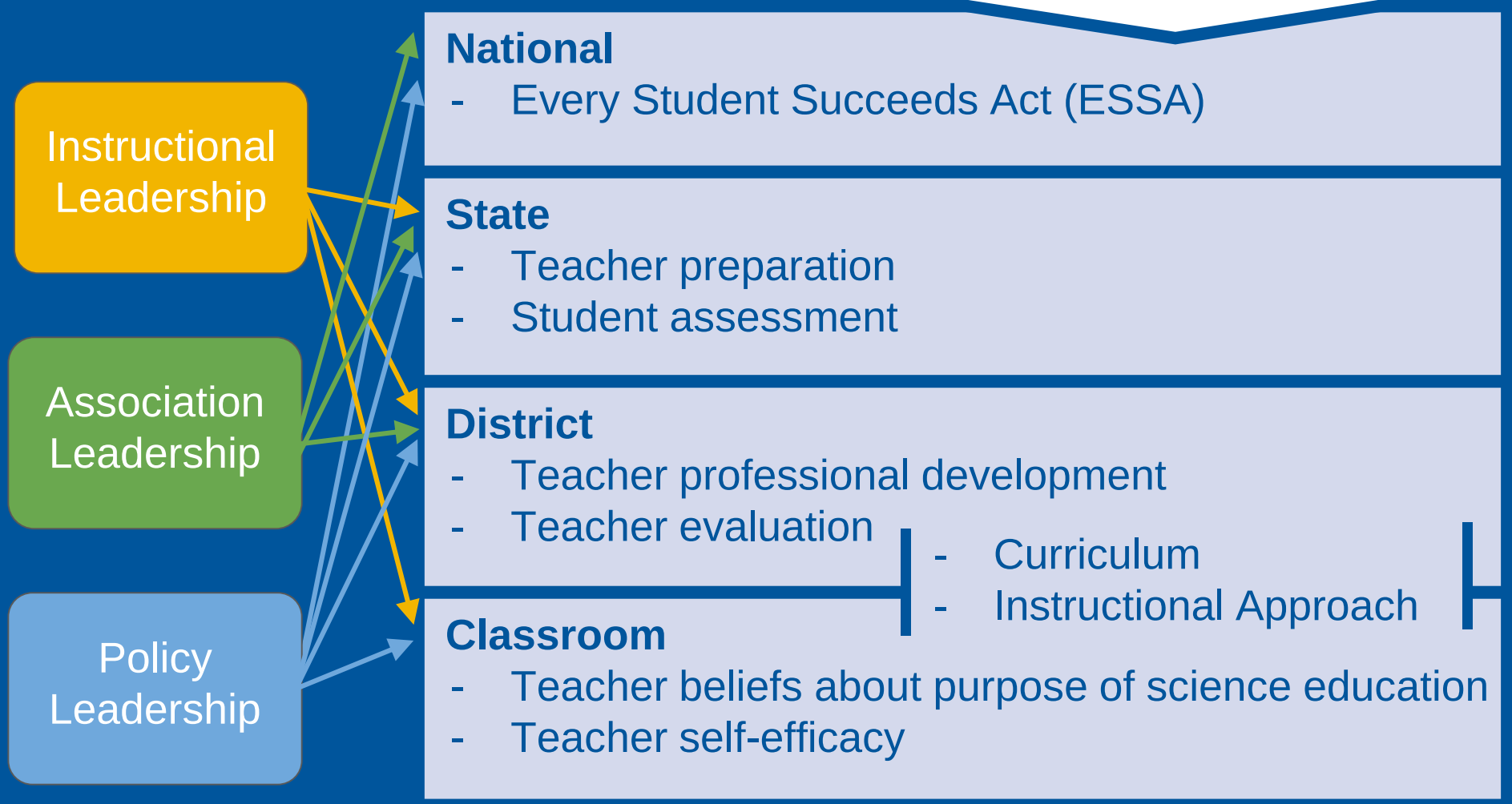
- Teacher self-efficacy

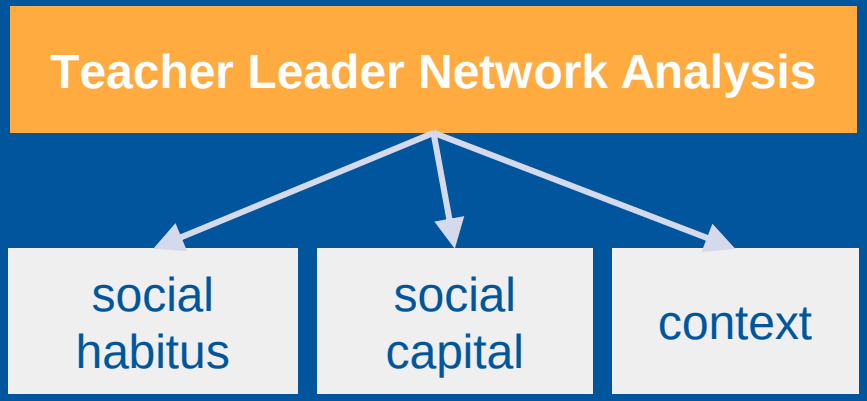
Science Education Reform

Teachers are leading
the science education system and policy reform conversations.



Intellectual Merit

How do we **systematically identify, develop, empower, and coordinate teacher leaders** to improve curriculum and instruction and inform education policy in K-12 physics and physical science education?



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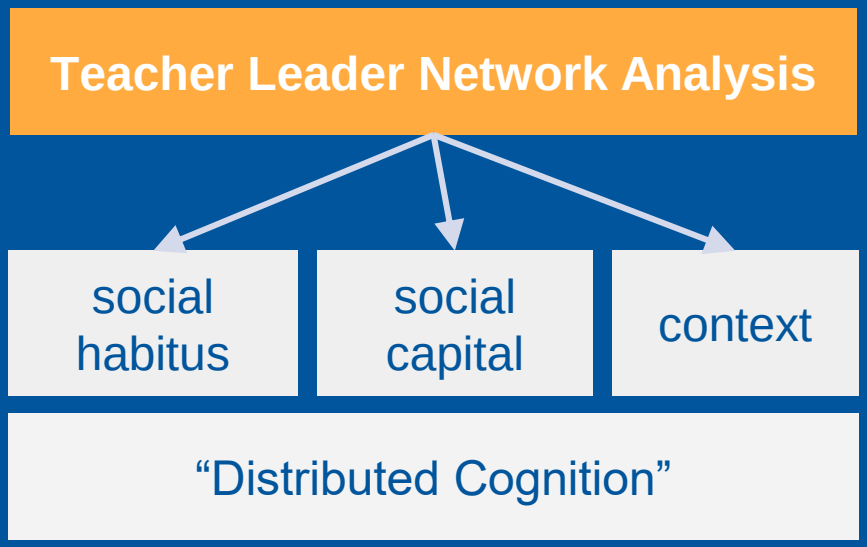

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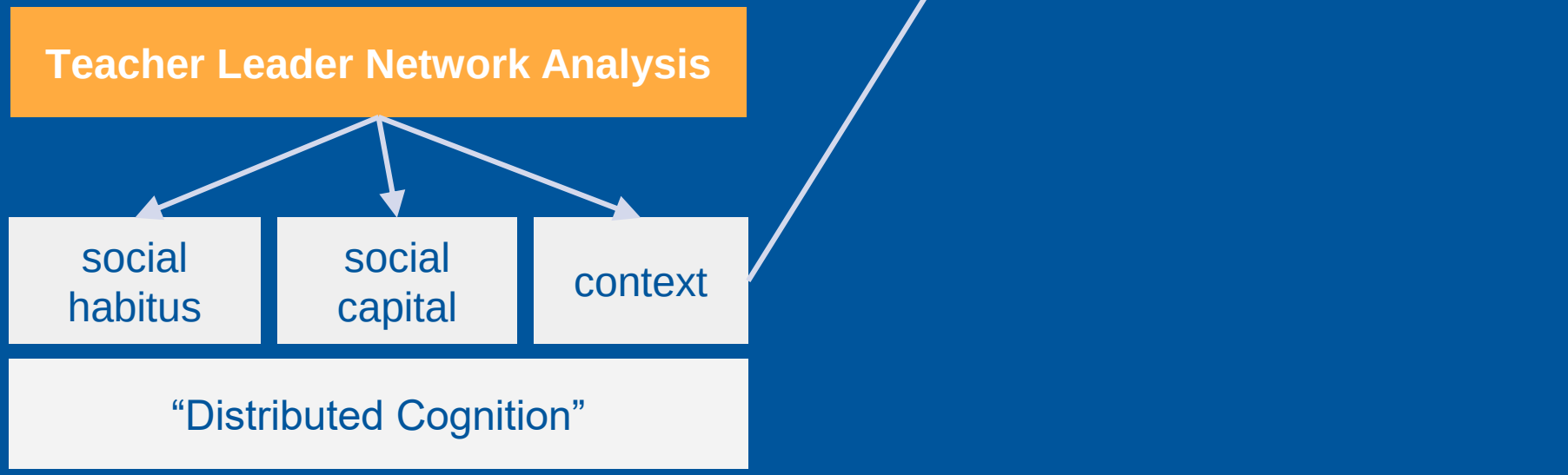

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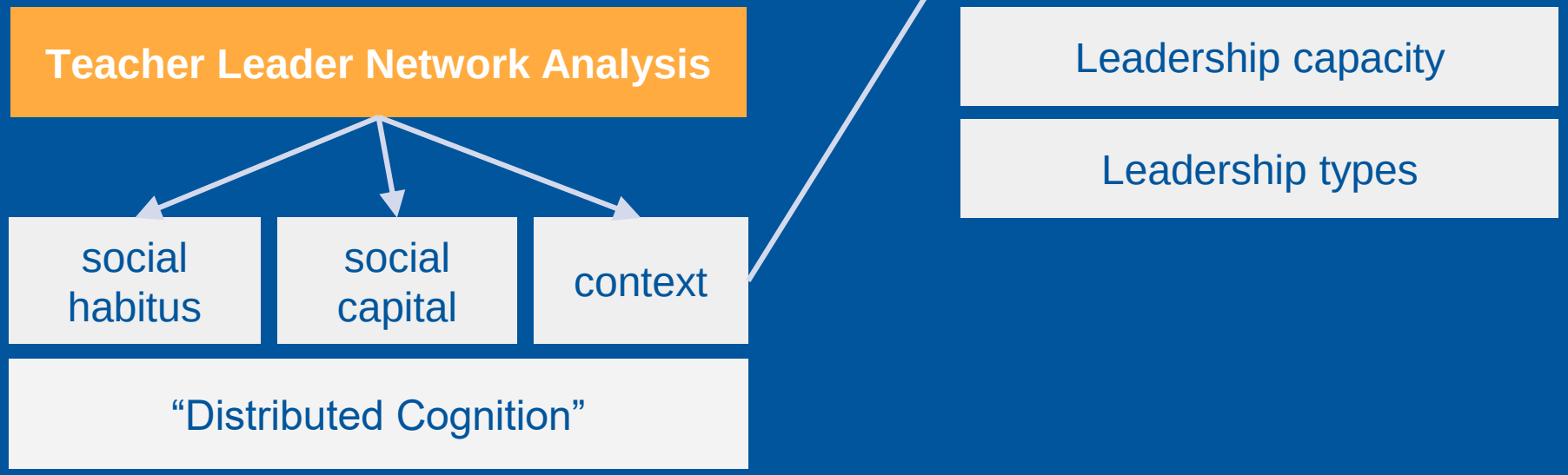

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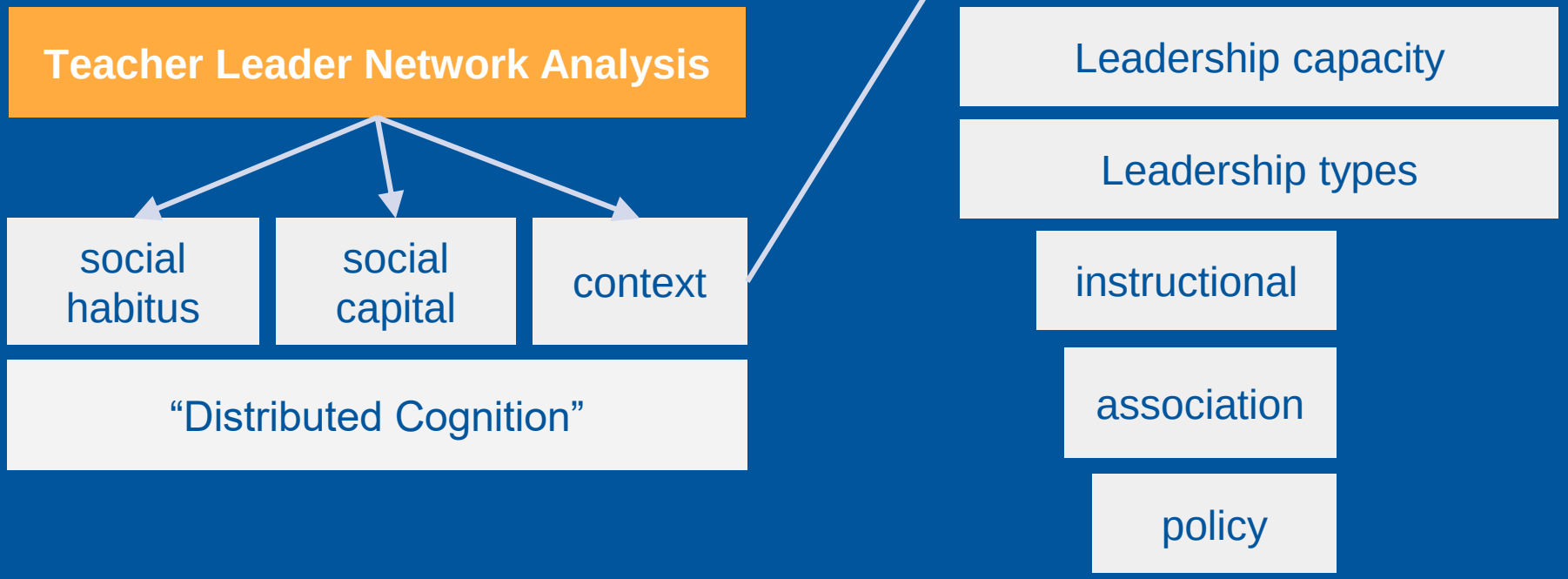

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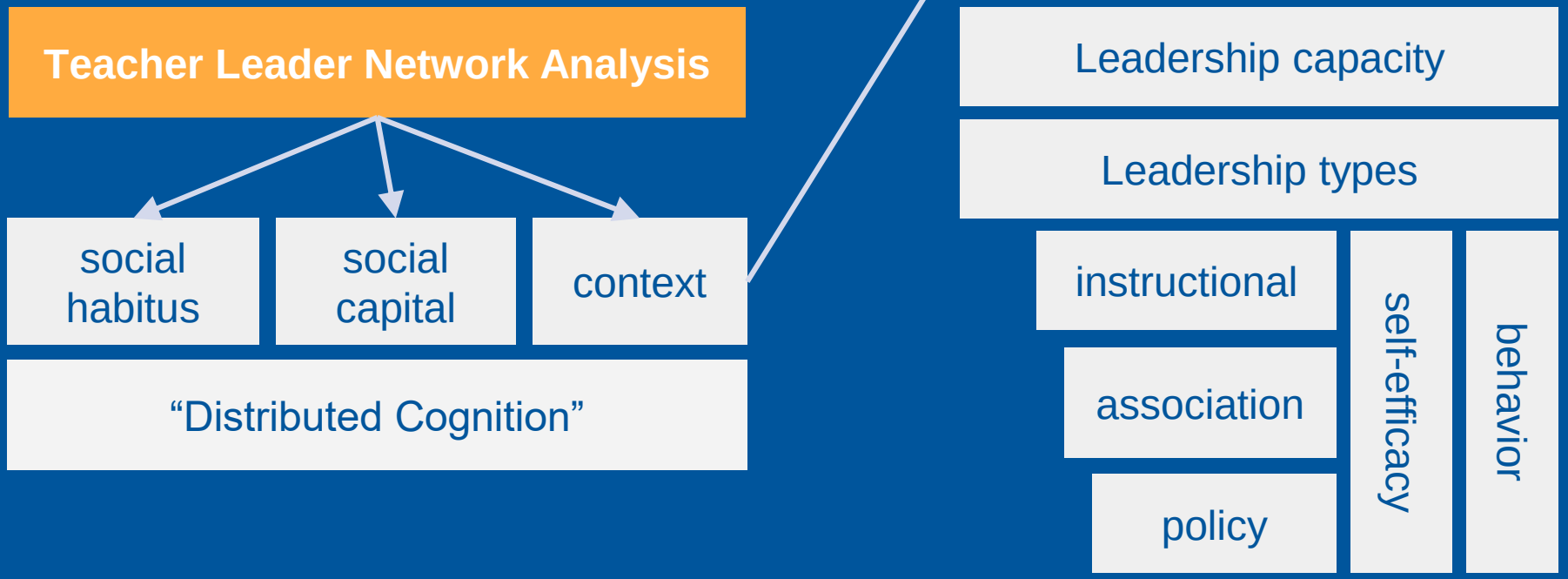


Intellectual Merit

Teacher Leader Network Analysis

social habitus

social capital

context

"Distributed Cognition"

Teacher Leader Analysis

Leadership capacity

Leadership types

instructional

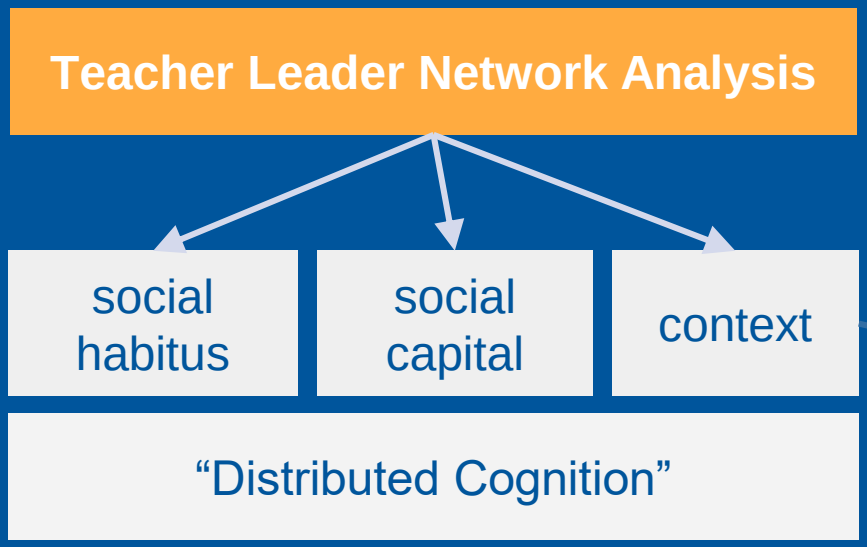
association

policy

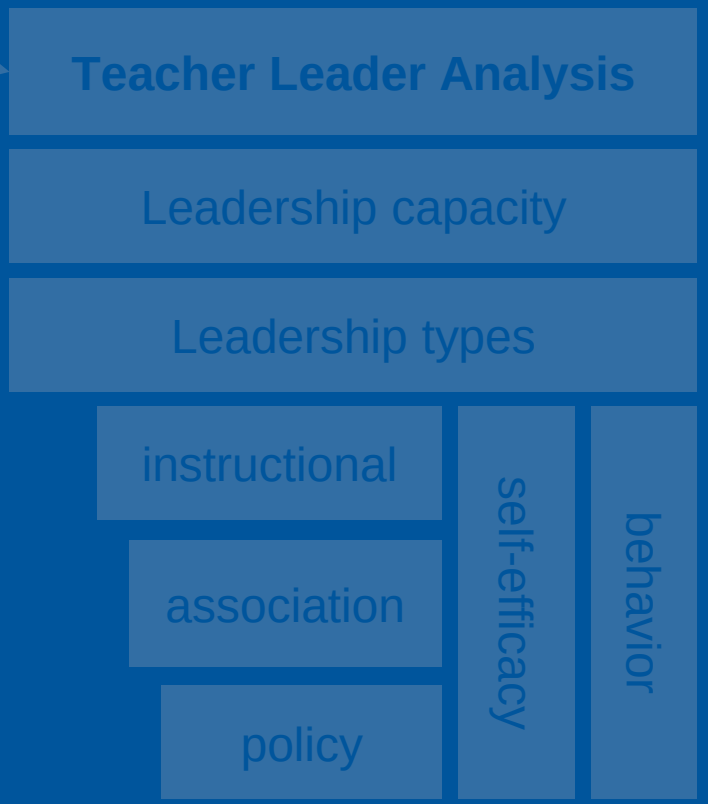
self-efficacy

behavior

Intellectual Merit



1. How do we identify teacher leaders?
2. How do we measure dimensions of characteristics in the context of K-12 physics teaching?
3. How do we support groups of teacher leaders?
4. How does context influence teachers' differential success?



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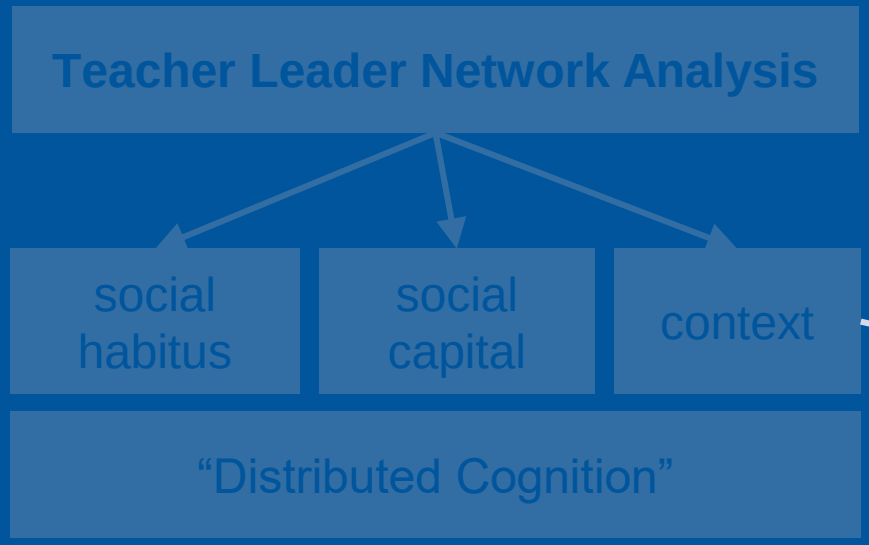
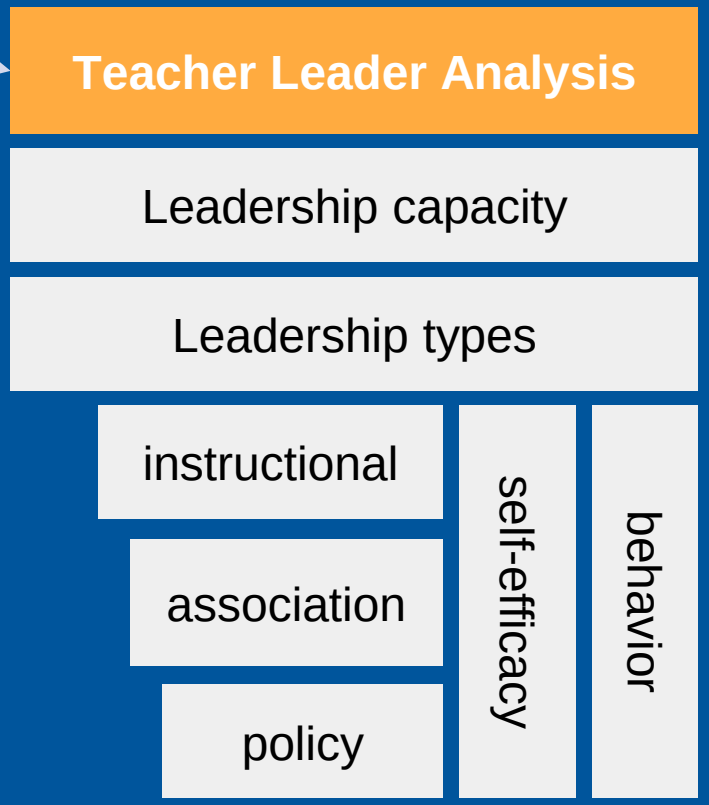


persona-based research



1. What essential characteristics define personas of teachers who demonstrate high potential for leadership?
2. What can prepared teacher leaders do?
3. How does teacher efficacy change as a result of leadership growth?
4. How does teacher behavior in each dimension change?

Multi-Level, Multi-Methods Approach

Network Analysis

Personas

Multi-Methods across **PROJECT** and **PROGRAMS**

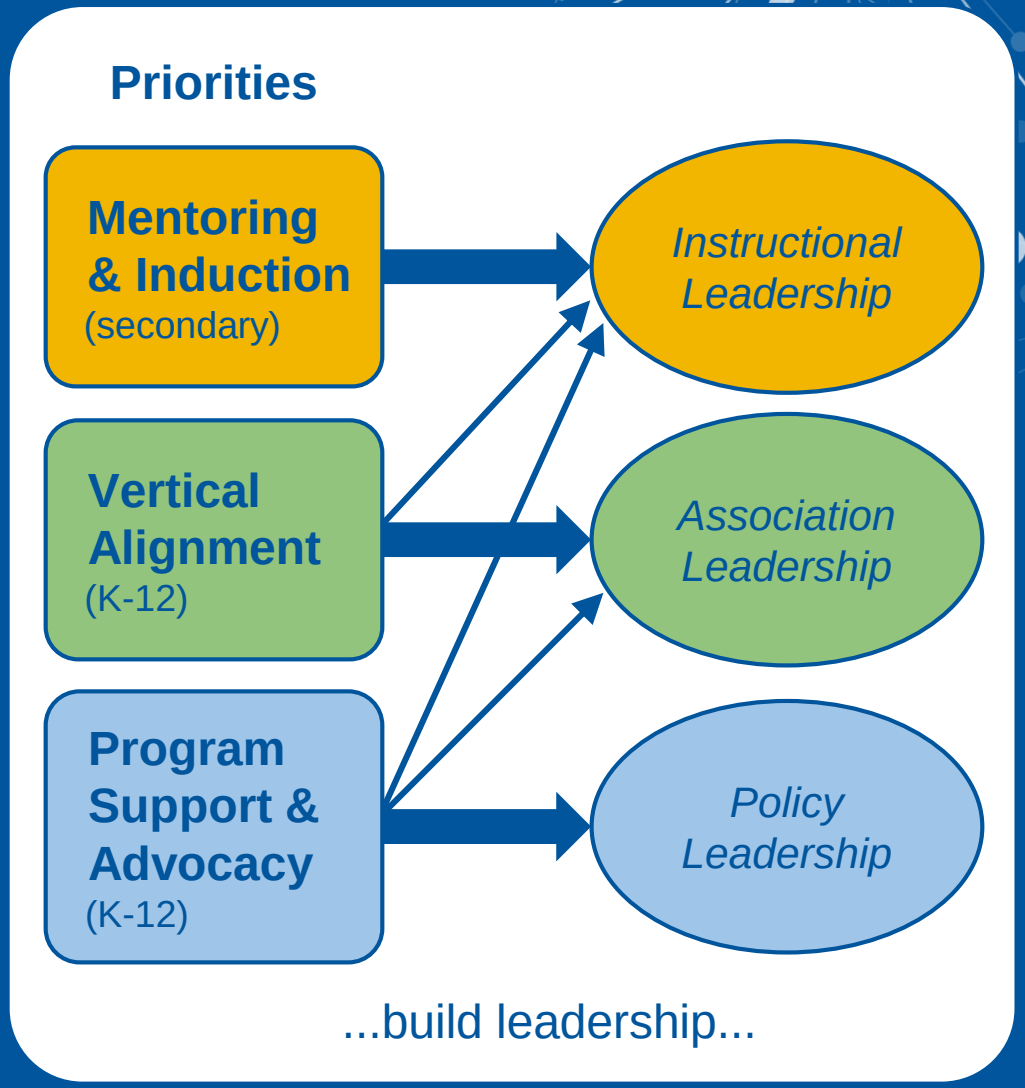
- Case studies / Tracking successes
- Phenomenography (persona-based research)
- Surveying (physics and physics teaching self-efficacy, identity, teaching and work experience, network survey)
- Latent class analysis
- Classroom observations
- Participant artifacts (journals, teacher project proposals, professional development deliverables)
- Student artifacts

Expected Outcomes

1. Empirically-tested **models of teacher leadership development** transferrable to other disciplines
2. Development of **teacher leaders** with strong **physics** and physics teaching identity
3. Development of **networked, supported groups** of teacher leaders
4. **Enhanced perception**—and reality—of teachers as leaders
5. **Persistence in the profession**
6. **Improved quality of K-12 physics education**

Broader Impacts

- Builds self-sustaining leadership
- Incorporates K-8 community
- Incorporates Higher Education community
- Reaches out to underrepresented groups



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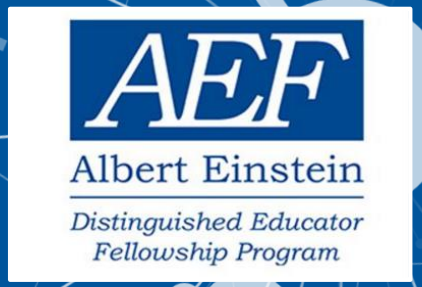
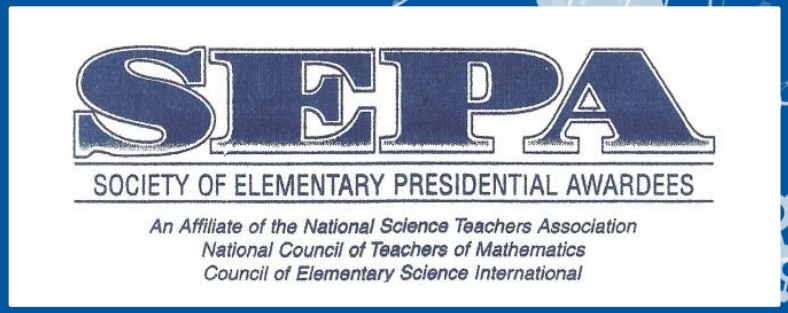
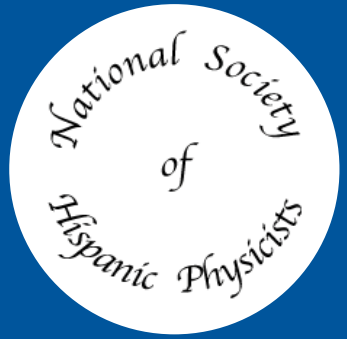
Some Potential Partners







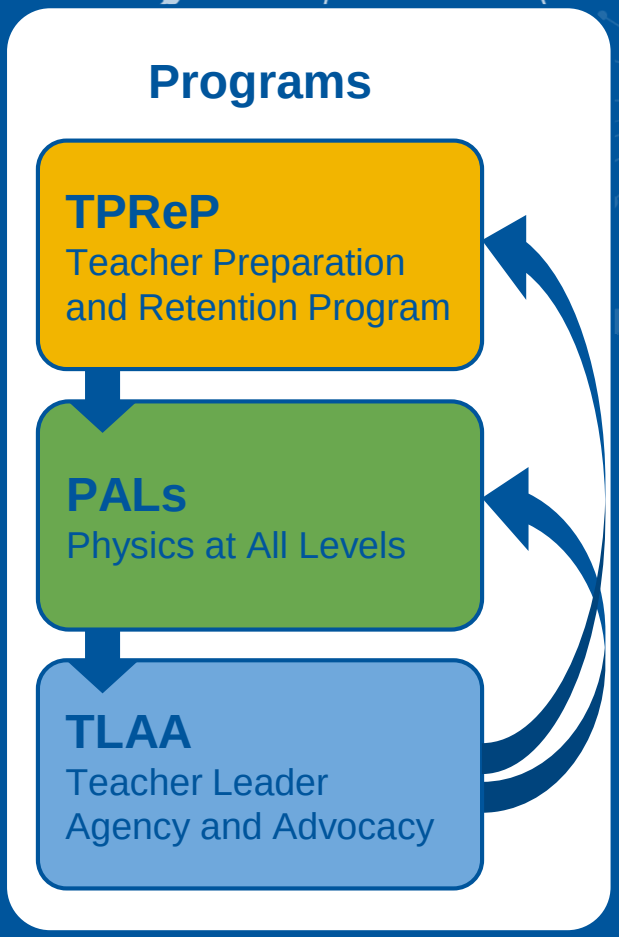
Feedback Requested

The task force seeks input on how to most effectively drive a research program that:

- Investigates the development and outcomes of teacher leader networks in each of the three identified priority areas:
  - Mentoring and Induction (TPReP)
  - K-12 Vertical Alignment (PALs)
  - Program Support and Advocacy (TLAA)

  and…

- Investigates the interplay among these three networks.



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