

**Fostering Inquiry-Based Science Education Through  
the Washington State Leadership and Assistance for  
Science Education Reform (LASER) Partnership**  
The Role of Battelle and the Pacific Northwest National Laboratory

INNOVEC Fifth International Conference

Jeff Estes

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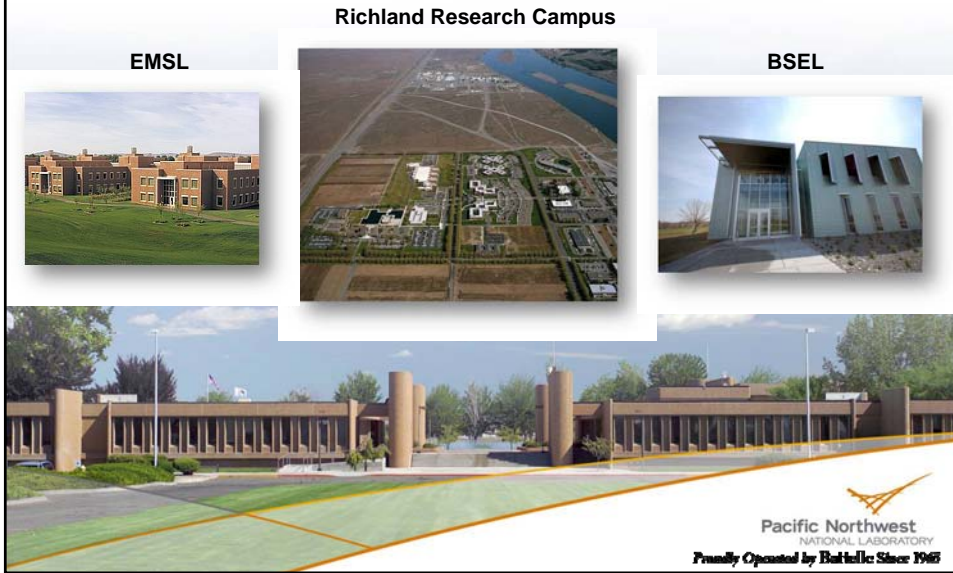
**Who is Battelle?  
What is the Pacific Northwest National Lab?**

- ▶ Battelle is a global science and technology enterprise that explores areas of science, develops and commercializes technology, and manages research laboratories for customers.
- ▶ Pacific Northwest is a U.S. Department of Energy – Office of Science laboratory, managed by Battelle, working to:
  - Strengthen U.S. scientific foundations for innovation;
  - Increase U.S. energy capacity and reduce dependence on foreign oil;
  - Prevent & counter terrorism and the proliferation of weapons of mass destruction; and
  - Reduce the environmental effects of human activities and create sustainable systems.

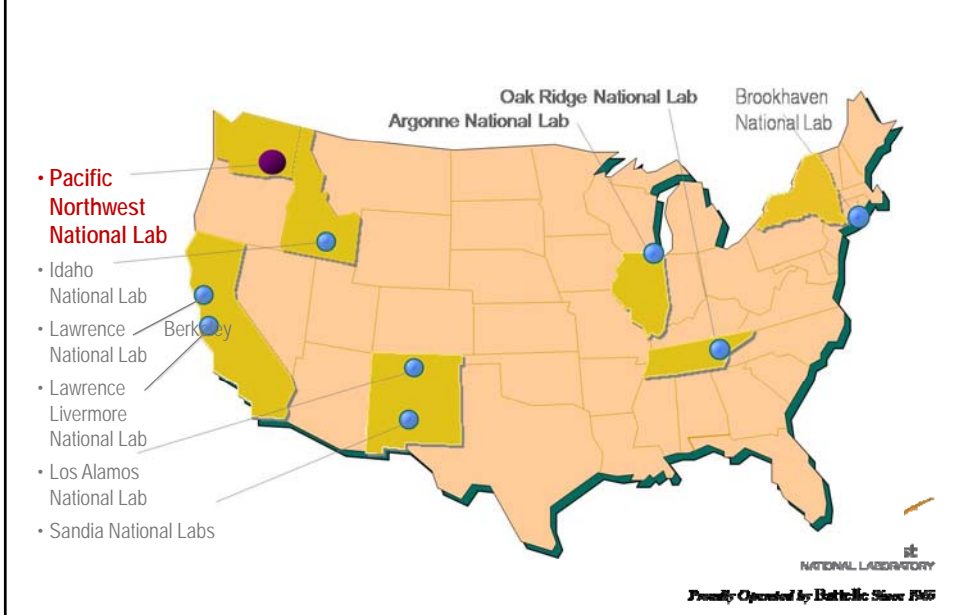


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## Battelle manages PNNL for the Department of Energy



## Washington is one of only 7 states to host a multi-program DOE national lab



## PNNL in the Northwest

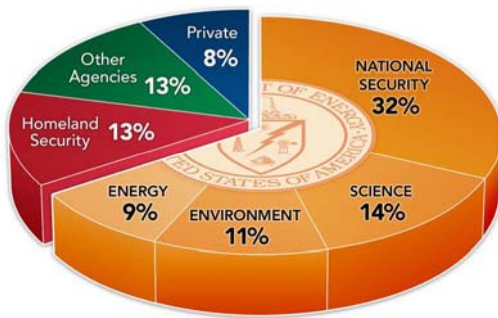


## PNNL is DOE-SC's most diversified lab

Reports to DOE's Office of Science

\$881M in business volume in FY08

4,200 staff



FY08 Business Volume		
DOE	\$583M	66%
DHS	\$116M	13%
Other Agencies	\$112M	13%
Battelle Private	\$70M	8%
<b>TOTAL</b>	<b>\$881M</b>	<b>100%</b>

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## PNNL mission outcomes

**Strengthen  
U.S. Scientific  
Foundations  
for Innovation**

**Increase U.S. Energy  
Capacity and Reduce  
Dependence on  
Imported Oil**

**Prevent and Counter Acts  
of Terrorism and the  
Proliferation of Weapons  
of Mass Destruction**

**Reduce Environmental  
Effects of Human  
Activity and Create  
Sustainable Systems**

  
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## Our founder, Gordon Battelle



**Ohio industrialist  
who believed that research  
could make industry more  
competitive.**

**Battelle Memorial Institute  
was established according  
to his will. Gordon specified  
that the non-profit institute  
would serve mankind through  
research, development,  
and education.**

  
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## Battelle's education impact flows directly from Gordon Battelle's Will

...“all the residue of my estate ...  
... for the purpose of creative and research work ...  
... the making of discoveries and inventions ...  
... undertake the discovery of processes and new experiments  
... license and dispose of such...  
**... and education of men and women for employment...”**

*What is the contemporary “best and highest”  
role for Battelle regarding this critical objective?*

  
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## Leveraging the collective enterprise

- ▶ Within our sphere of influence, our interest is education impact through
  - charitable distributions into programs we help design or can impact
  - engagement of passionate technology-based workforce
  - Leveraging relationships with like-minded enterprises that want to make a difference
  - creation of partnerships on key regional/national initiatives



  
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## Desired Outcomes

*“the direction we are trying to help influence”*

### ► Societal Benefit

- Increase the number of science and technology literate global citizens, and the number who choose to pursue STEM careers
- Improve the way teachers are prepared in the STEM disciplines
- Make STEM careers more visible, and the path to get there
- Mobilize the power of the private sector as a core partner in education
- Improve early childhood readiness

### ► Renewal and Enlightened Self-Interest

- Build a long term pipeline of new talent available to Battelle and our current/future affiliates by deepening the supply chain
- Diversity
- Enrich regional talent base



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## Key Principles of Battelle Programs

**MODEL CATALYZE** Actions designed as catalysts to mobilize other aligned investments

Learn from others and offer our work transparently to others so it is valuable in real time

**CONNECT** Connecting as many related efforts as possible to bring new scale to the education solutions

**SCALE** A focus on efforts that are designed from the outset to be scalable, replicable, and sustainable

A Focus on Impact

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## 43 years of community and regional stewardship

### ▶ Battelle making corporate investments

- \$124 million in research capabilities and facilities at PNNL
- \$15.7 million to charitable activities in region
- Team Battelle hours for 2008
  - 1,795 volunteers
  - 21,137.35 hours
  - Up to 60 projects yearly



### ▶ Helping to develop the S&T workforce

- *Reforming science education in Washington*
- Creating entrepreneurs of the future

### Supporting economic development

- Jobs
- Technical assistance
- Free technology assistance
- Entrepreneurial assistance
- Access to funding
- Access to specialized equipment and facilities
- Connections to customers, partners, leaders, advisors
- Educational events



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## The STEM Education Signature @ PNNL

*Driver #1: Supporting DOE's National Workforce Goal*

▶ **National Goal:** *The Office of Workforce Development for Teachers and Scientists (WDTS) will prepare a diverse workforce of scientists, engineers, and educators to keep America at the forefront of innovation. The Department of Energy will utilize its unique intellectual and physical resources to **enhance the ability of educators and our Nation's educational systems to teach science and mathematics.***

- Educator Strategy – Middle school to undergraduate educators
- Student Strategy – Middle school through undergraduate students

DOE-WDTS Future Workforce Strategy (July 2007)



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## The STEM Education Signature @ PNNL

Driver #2: Capitalizing on Battelle's Strategic Framework for Actions

Catalyst for Sustainable Positive Change in  
STEM Education at Local-Regional-National Scales

ADVOCACY – AWARENESS - TOOLS		MODEL PROGRAMS	
<b>Policy Shaping</b>	<b>Business-in-Education Alliance</b>	<b>Design &amp; Initiate</b>	<b>Amplify &amp; Accelerate</b>
Bring clarity to problem and raise visibility among leaders who can enact change	Mobilize private sector to action through portfolio of tools and resources; make the private sector an engaged investor in education	Scalable initiatives that use Battelle as founding participant in design process	Advance pace of proven programs that produce results but require additional resources and partnerships to broaden impact



## The STEM Education Signature @ PNNL

Driver #3: Delivering on the Lab's Critical Outcome for STEM Education

► **Critical Outcome:** *Strengthen and advance science, technology, engineering and mathematics education in the Northwest.*

- Support efforts to address PNNL's workforce needs.
- Enhance the reputation of the Laboratory by being a recognized leader in state and national reform in STEM education.
- Facilitate broad community leadership and commitment to establish the first sustainable STEM school in the state of Washington.





# The STEM Education Signature @ PNNL

Strategic Objective: Catalyzing Positive Sustainable Change in STEM Education...

## PNNL's Education Signature

Amplify & Accelerate  
Design & Initiate  
Influence Awareness and  
Public Policy  
Business-in-Education  
Alliance



## Three Initiatives

- 1 Meeting the STEM Workforce Challenge
- 2 Transforming STEM Learning & Teaching in the 21st Century
- 3 Creating Public Schools Increasingly Focused on STEM Education

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# NSRC's LASER Model

An Organizer for Science Education Reform in Washington

## Science Education: Preparing Today's Children for Tomorrow's World

### Theory of Action

- NSRC developed the Theory of Action to
- guide school districts in establishing research-based science education programs
  - improve teaching and learning
  - increase overall student achievement.



### Building Blocks of Reform

Washington State LASER uses the NSRC Theory of Action to

- offer a portfolio of products and services
- help key stakeholders plan, implement and sustain effective science education programs.



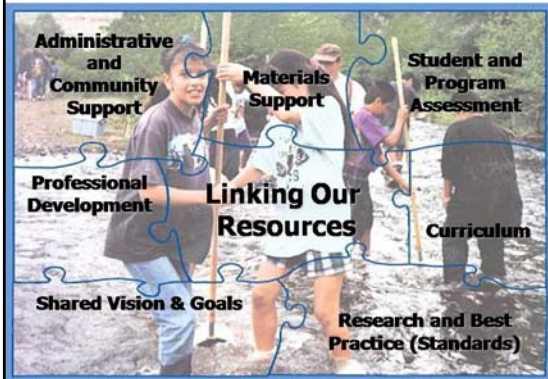
## The NSRC Model

- ▶ Theory of Action
- ▶ Building Blocks of Reform
- ▶ Key Components Aligned with School Improvement

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## The STEM Education Signature @ PNNL

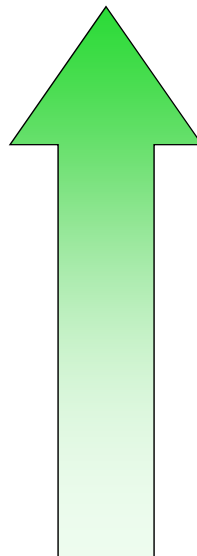


How should we use the financial, human and technical resources of DOE, PNNL and Battelle to catalyze improvements in STEM education?



## Greater Impact, Equitable Results

Systemic Reform  
 Community Alliance  
 Coordinated Resources  
 On-Going Professional Development  
 5-10 Year Initiatives  
 Standards-Based Science Framework and Assessments  
 1-3 Year Projects Summer Institutes Resource Center Teacher Workshops  
 Adopt-A-School  
 Classroom Visits  
 Teacher/Student Recognition  
 Lectures  
 Equipment Donations  
 Science Fair Judging



All Classrooms  
 Benefit Equally

### Roles for Scientists and Engineers in K-12 Science Education Reform

**National Research Council,  
 The CATALYST, January 1995**

Some Classrooms  
 Benefit



## Science Education: Prepare All of Washington's K-12 Students for a "Flat World"



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## The STEM Education Signature @ PNNL

Initiative #2: Transforming STEM Learning & Teaching

### PNNL's Education Signature

Amplify & Accelerate  
Design & Initiate  
Influence Awareness and  
Public Policy  
Business-in-Education  
Alliance



### Three Sub-Efforts

**A**

Leadership & Assistance  
for Science Education  
Reform (LASER) 1.0

**B**

LASER 2.0

**C**

Washington State STEM  
Education Center



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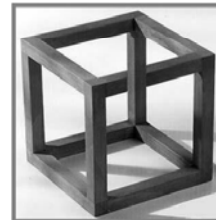
## Addressing “science challenge” would require active participation from every sector



  
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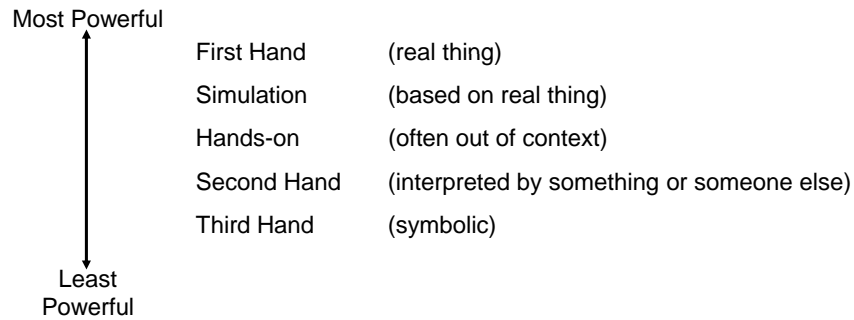
## Common Leadership Challenges in Community Initiatives

- ▶ Achieving goals requires multiple groups to cooperate
- ▶ Feeling isolated or ill-qualified
- ▶ Influence without direct control
- ▶ Lack of resources
- ▶ Multiple points of view and motivations
- ▶ Distractions
- ▶ Parties with vastly different priorities
- ▶ Traditional rewards not aligned with group goal
- ▶ Not been tried before, or was not successful last time
- ▶ Disagreement on process or approach
- ▶ Our situation is different; examples from elsewhere don't apply

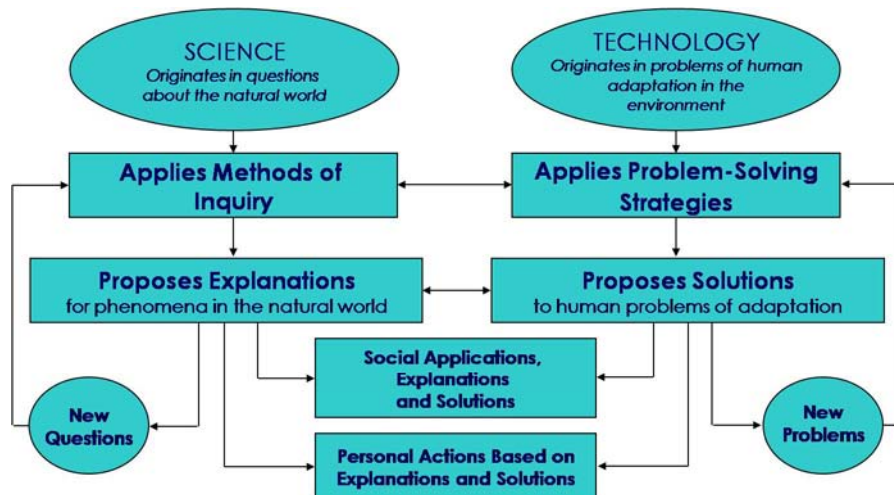


  
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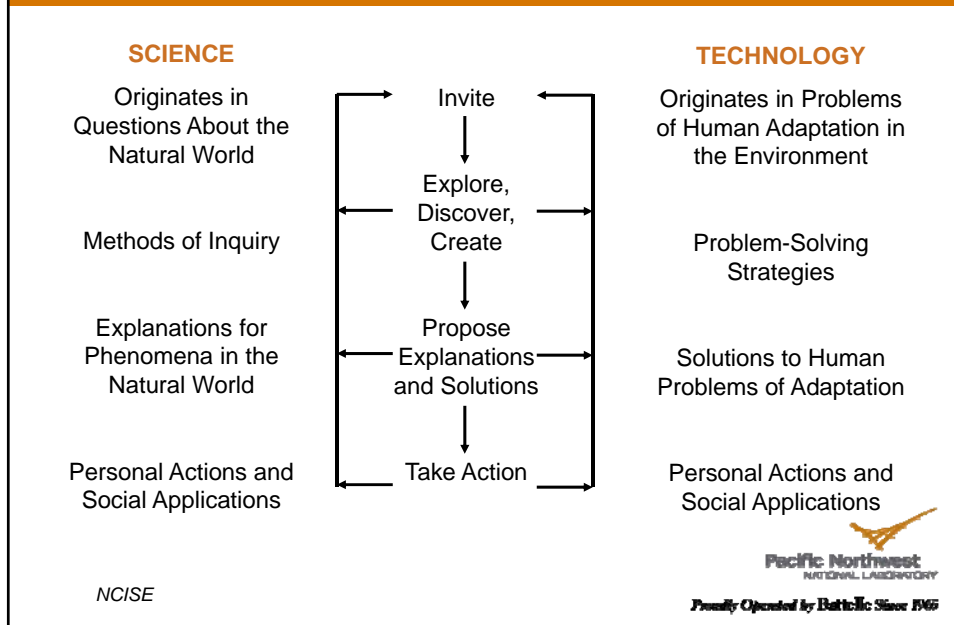
## Range of Learning Experiences



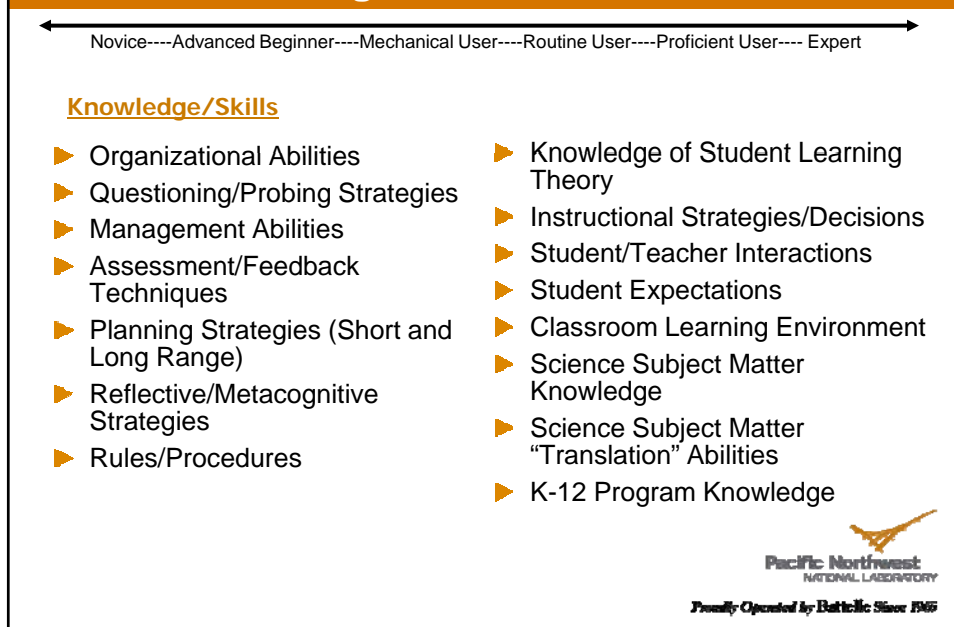
## The teaching/learning model should reflect the relationship between science and technology



## The Teaching/Learning Model



## The PD Challenge and Our Stakeholders



## Promoting and Growing WA State LASER Battelle/PNNL Engagement

### ▶ Statewide Leadership

- Provide “in-kind” support and thought leadership for science policy and program efforts at state level.

### ▶ Community/Regional Leadership

- Provide staffing, materials and professional development products and services in the Mid-Columbia education leaders.

- ▶ Co-Director –WA State LASER,
- ▶ Co-Director – SE Washington LASER Alliance,
- ▶ Lead Facilitator – Strategic Planning Institute,
- ▶ Lead Facilitator – Yakima Valley Tri-Cities LASER Networking Forums,
- ▶ Co-facilitator – BSCS National Academy for Curriculum Leadership,
- ▶ Committee Member – OSPI Instructional Materials Review Committee,
- ▶ Committee Member – OPSI Science Standards Committee,
- ▶ Committee Member – OSPI Science Assessment Leadership Team, and
- ▶ Advocate/Thought Leader - Key business and community advocacy and policy organizations,



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## Promoting and Growing WA State LASER Battelle/PNNL Engagement

### ▶ Curriculum

- Provide grants for curriculum materials and implementation.
- Design products to extend, enhance and enrich the “core” science program.

### ▶ Materials Support

- Provide grants and technical assistance to support science materials center operations

- ▶ Provide Battelle grants for curriculum and instruction projects,
- ▶ Support scientists and engineers as classroom speakers,
- ▶ Sponsor teacher/scientist projects to enhance curriculum,
- ▶ Help lead statewide science notebooks project
- ▶ Provide leadership for STC curriculum alignment project to WA State Science Standards
- ▶ Provide volunteers for materials center,
- ▶ Purchase curriculum modules, and
- ▶ Provide grants to underwrite costs for districts to “buy-in” to program (e.g., delivery system).



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## Promoting and Growing WA State LASER Battelle/PNNL Engagement

### ▶ Teacher Professional Development (PD)

- Provide PD for classroom teachers (from novice to expert)
- Provide PD for classroom teacher leaders, PD providers and statewide leaders

### ▶ Administrator Professional Development (PD)

- Provide PD for building, district and regional administrators

- ▶ Coordinate and/or lead "foundational" PD,
- ▶ Deliver teacher leader PD on science modules, content training, inquiry and assessment,
- ▶ Build cadre of professional development providers/instructional improvement facilitators,
- ▶ Deliver statewide and regional programs and academies focused on designing, implementing and evaluation professional development, and
- ▶ Lead principal workshops and administrator retreats for Mid-Columbia schools.



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## Promoting and Growing WA State LASER Battelle/PNNL Engagement

### ▶ Assessment/Evaluation

- Provide leadership for school-based assessment efforts
- Foster improved communication between evaluator and field sites
- Interface with evaluator

### ▶ Business/Community Support

- Connect human, financial and technical resources in ways that enhance the LASER partnership

- ▶ Curriculum Topic Study Assessment Probes
- ▶ STC Modules Pre/Post Assessment Project
- ▶ Communication "conduit" between LASER evaluator and LASER Alliances
- ▶ Strategic and tactical planning with LASER's lead organizations
- ▶ Legislative activities/government relations
- ▶ Public affairs, advocacy and outreach
- ▶ Thought leadership with Governor, Legislature, Washington Business Roundtable and science/technology advocacy organizations
- ▶ Lead gifts stimulating additional philanthropy
- ▶ PD for scientists and engineers at PNNL



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## LASER 1.0: 1999 – 2008

Initiative #2: Transforming STEM Learning & Teaching

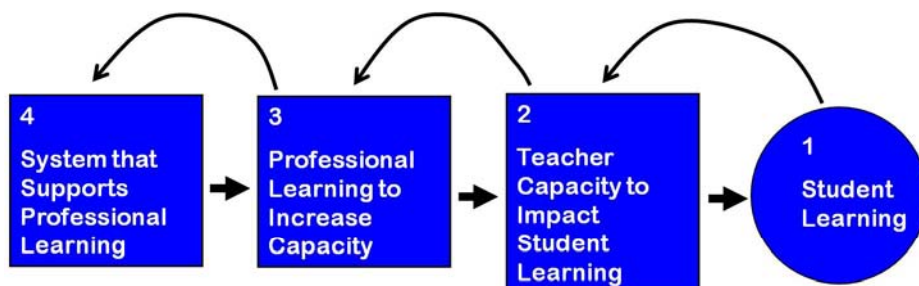
### Built a Network

- ▶ Increased the number of LASER school districts from 30 to 200
- ▶ Grew the number of Regional Alliances (hubs) serving school districts grew from 4 to 9
- ▶ Created a LASER “brand” from the bottom up (elementary schools – to middle schools – to “early adopter” high schools)
- ▶ Focused on leadership, curriculum, professional development of classroom teachers and technical assistance
- ▶ Emphasized current research and best practices
- ▶ Built strategic relationships with business, government, the public and the K-16 system
- ▶ Leveraged federal, state, local and corporate funding (~\$50-\$60M) to improve instruction, provide teacher professional development, access to equipment/materials, and enhance leadership and community support

  
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## Next Steps/Taking Stock: Shifting from what is taught to what is learned

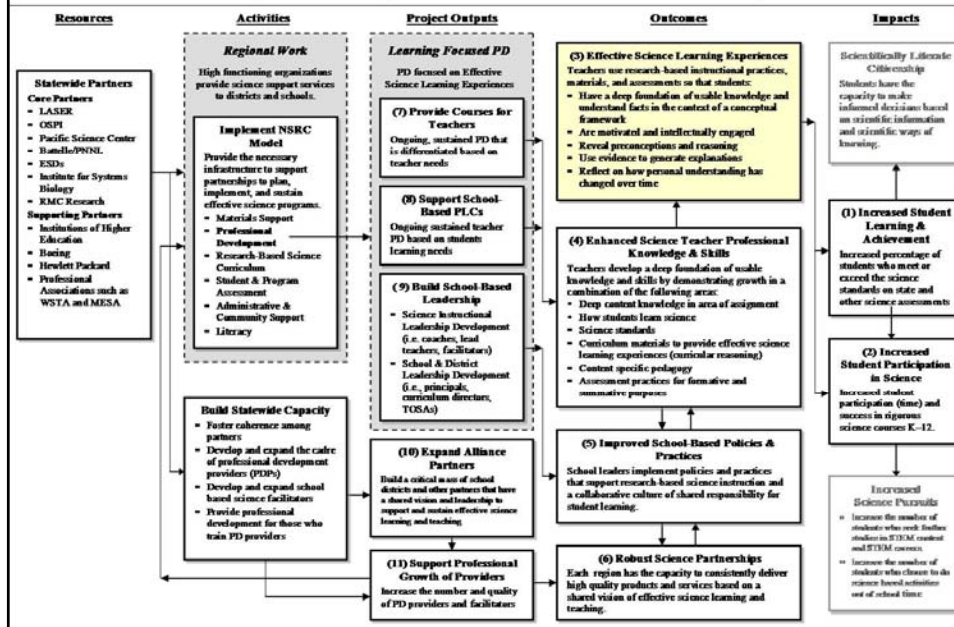


  
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# A Renewed Focus on Professional Development

## Washington State Logic Model for Science Professional Development



## What This Means for Us

- ▶ **Adapting our work** and moving forward based on current research and practice – a key characteristic of sustainability
- ▶ **Positioning ourselves** to be competitive on future funding opportunities (Race to the Top, NSF, other funders)
- ▶ **Refining existing PD** so that the vision of effective science instruction that we learned from research is very explicit
- ▶ **Working side-by-side** school personnel to support the science learning of students
- ▶ Deepen and **strengthen existing partnerships** with ESDs, HE, community partners



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## LASER 2.0: 2009 – 2013

Initiative #2: Transforming STEM Learning & Teaching

### Amplify/Accelerate

- ▶ Engage Local & State Leaders in Leadership Forums
- ▶ Enhance Curriculum & Instruction Projects
- ▶ Enrich Administrator, Teacher & Scientist/Engineer Professional Development
- ▶ Extend Equipment & Materials Support Efforts
- ▶ Expand Efforts in Assessment, Evaluation & Research
- ▶ Launch a “Science Initiative Schools” Project
- ▶ Amplify Stakeholder Advocacy & Marketing Efforts
- ▶ Be a Valued Partner/Resource within the Emerging WA State STEM Education Center



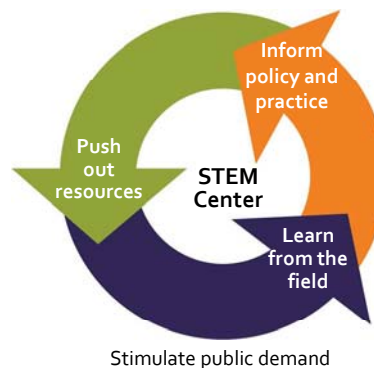
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## WA STEM Education Center

Transforming Teaching & Learning

▶ Participate in efforts to establish a statewide 501c3 STEM Center with world-class talent and resources to:

- Sponsor innovations;
- Increase teacher effectiveness;
- Design and deliver enabling resources; and
- Accelerate improvements in STEM achievement.



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## WA STEM Education Center

*Creating Coherence & Alignment*

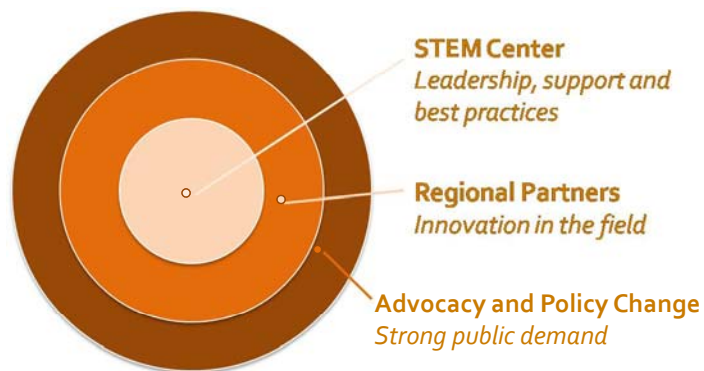


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## WA STEM Education Center

*Transformation to Scale*

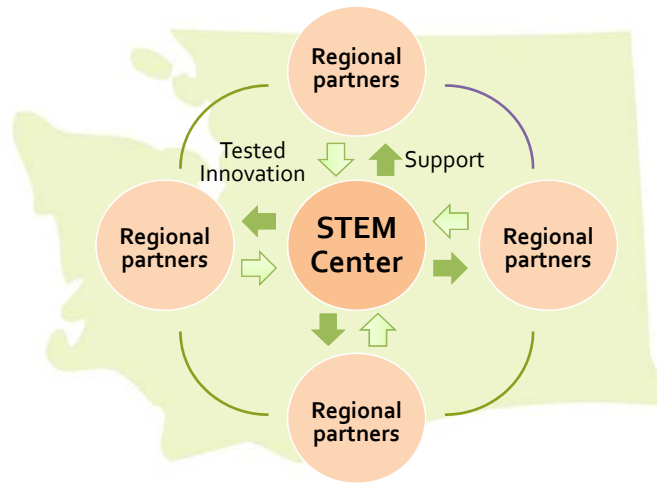


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## WA STEM Education Center

*A Learning Network*



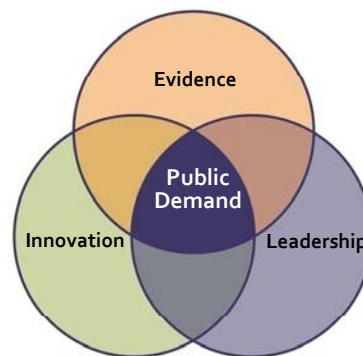
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## WA STEM Education Center

*Stimulating Public Demand*

► Collaborate with business, community, education and government leaders, influencers and stakeholders to:

- Create a “tipping point” around the importance of STEM education for all students;
- Build political will and leadership; and
- Network and communicate proven innovations.



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