

***Science Education and Workforce Development
Key Challenges for Innovation in the States***

**NGA STEM Centers in the States:
Pennsylvania STEM Center**

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Workshop and Exhibition
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If you think your bridge building is hard...



Overview

- MSPGP—Who we are and what we've learned
- DVIRC—Who we are and why we're here
- The Regional Compact—What is it?
- NGA/Team PA STEM Center Initiative
- Regional STEM Center Development

Where: Greater Philadelphia



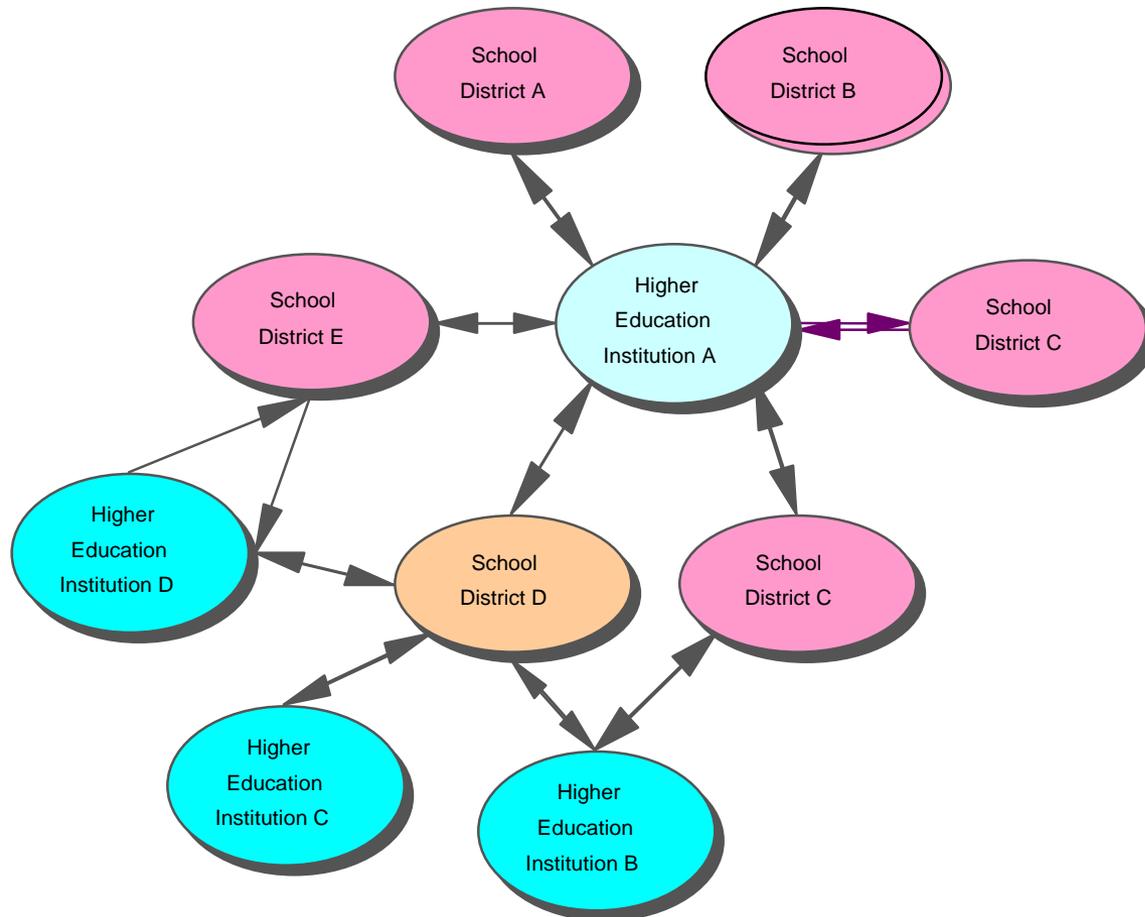
MSP Goals

- **Ensuring that all students have access to, are prepared for, and are encouraged to participate and succeed in, challenging and advanced mathematics and science courses**
- **Enhancing the quality, quantity and diversity of the K-12 mathematics and science teacher workforce**
- **Developing evidence-based outcomes that contribute to our understanding of how students effectively learn mathematics and science.**

MSP of Greater Philadelphia Region



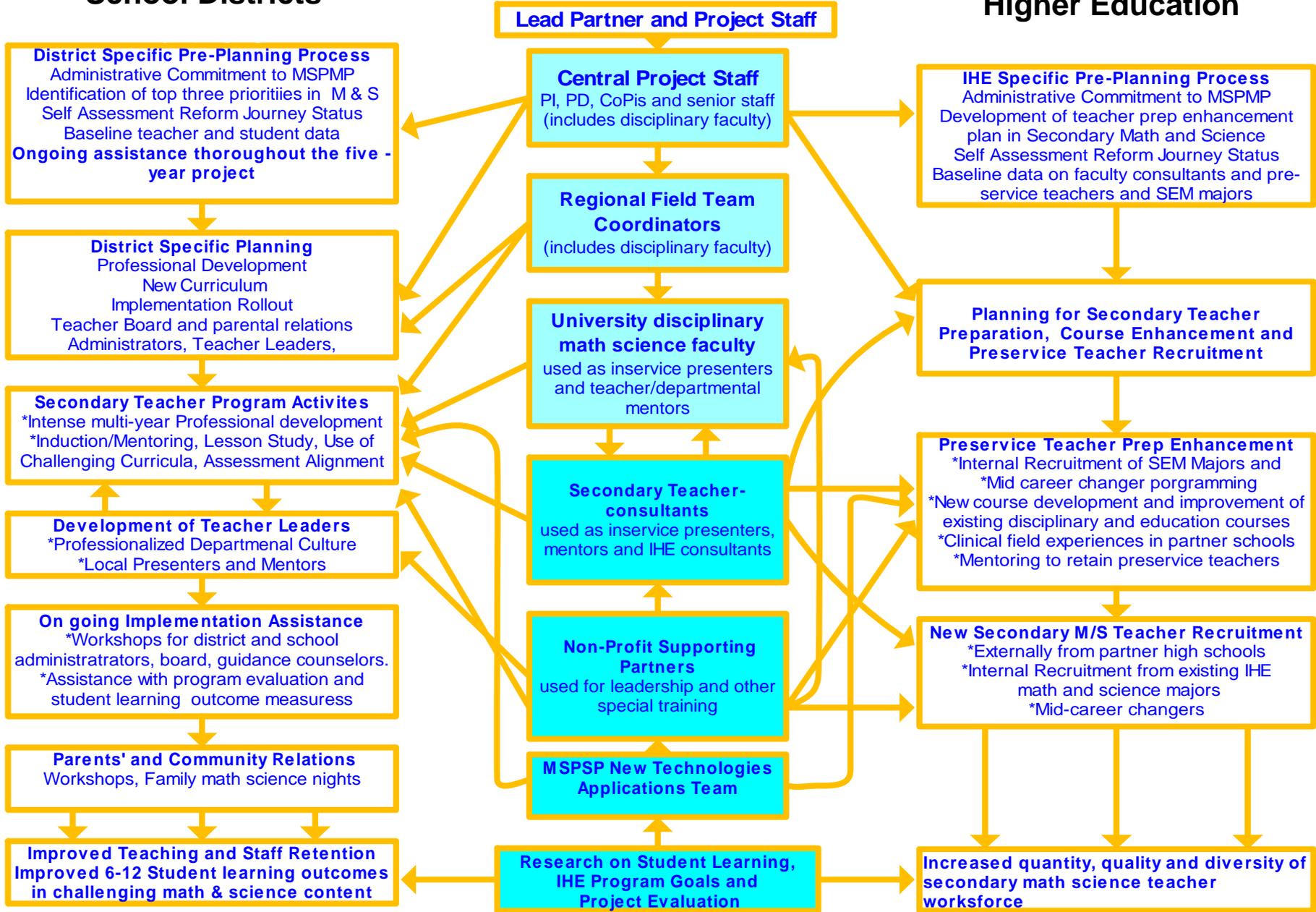
Goal: Closing the “Open Loop” Relationship between Institutions of Higher Education and School Districts



School Districts

MSPGP

Higher Education



DVIRC's Reason for Being

Mission: To grow business value through consulting services, talent development, and corporate finance/growth capital

- Non-profit economic development corporation
- Three strategic thrusts:
 - Consulting services to over 100 companies per year
 - Corporate Finance: Succession / Business Ownership
 - **Talent Development**



A PREMIER REGION IN THE BUSINESS OF MAKING THINGS

DVIRC, its Economic Development and Education Institution Partners are committed to...

Delivering Comprehensive Consulting & Financial Services

Developing a Talent Pool With The Education and Skills Needed by Companies

Supporting the Current Period Of Significant Ownership Transition So That It Results in Sector Strength and Company Scale In the Region

Characteristics of a Premier Manufacturer include...

Leadership That Supports Growth

Strategy That Supports Growth

Culture That Enables Growth

Operational Excellence That Enables Growth

Continuous Education

Human Capital / Infrastructure

Growth / Succession Strategy/Access to Capital

Characteristics of a Premier Region include...

Profitable Growth

Innovation

Export

Productivity

Job Growth

Educational System That Supports STEM

Sector Strength / Company Scale

Which Produce these Benefits...

High Standard of Living

Quality of Life

Sustained Economy

Competitive Position



Business Issues

- Demographic shift
- Cost of hiring
- Cost of training
- Cost of turnover
- Relentless competition...for business
AND **for talent**

What do businesses need?

- People that are:
 - Technically proficient
 - Well-educated
 - Critical thinkers
 - Innovators
 - Team players

So What's the Problem?

High School Math Teachers Typically View Unmotivated Students as the Chief Problem

Why Do Students Have Low Motivation to learn math?

- A Lack of parental support and encouragement
- Standards are not set high, and when they are, the students and the parents unwilling to deal with the reality of the standard
- Priorities include everything but school/academics
- No work ethic
- Special Ed. Kids are able to use their disability as an excuse for not achieving
- Lack of maturity, “spoiled” kids, lack of accountability
- Educational policy is not in place and where it is in place is not strictly enforced
- Passivity

**Anything jump out at you from this list?
Like What is Missing?**

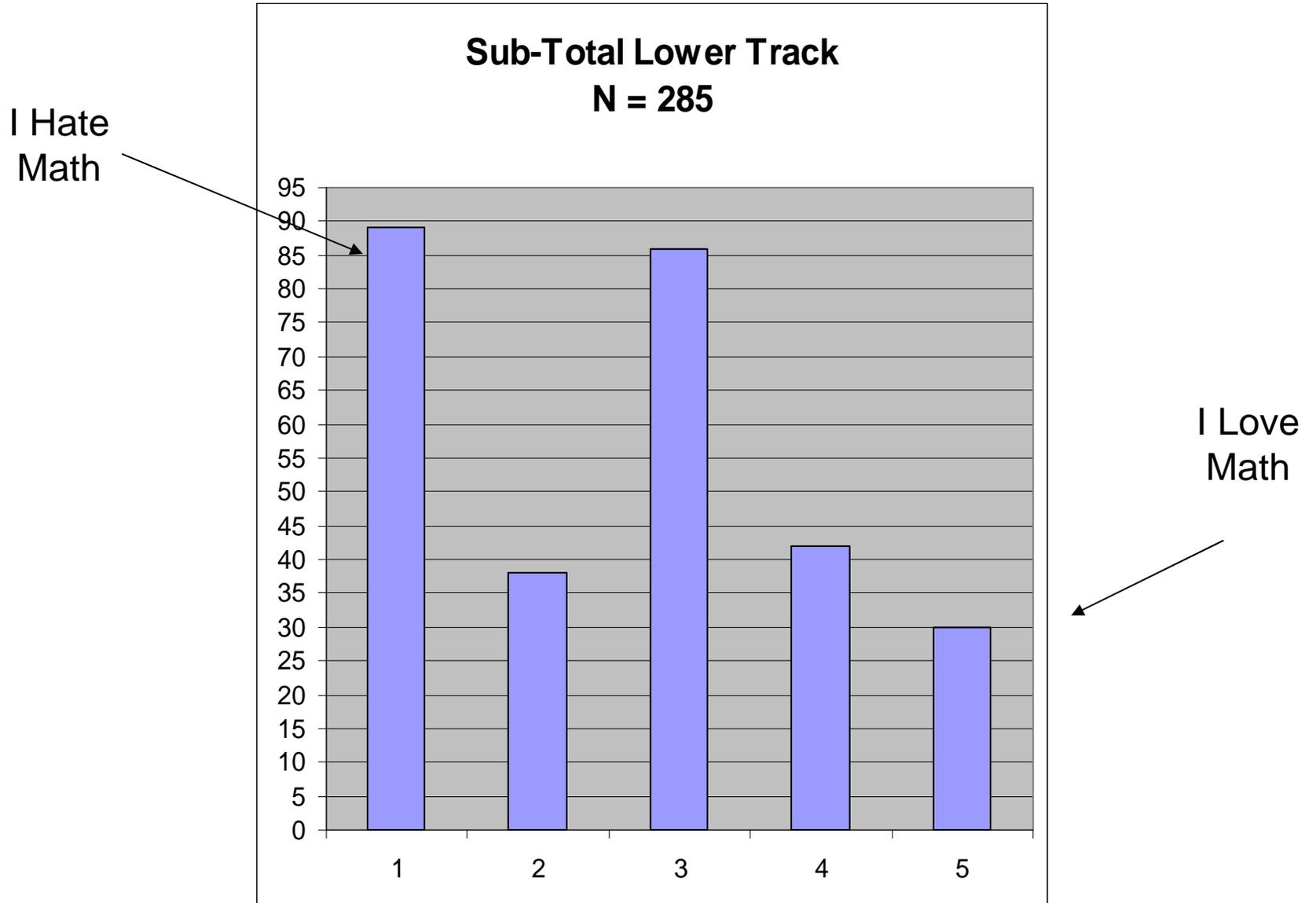
But Ask High School Students How They Think of Math Using Metaphors

- **“If Math Were a Color It Would Be Midnight Blue Because as Hard as I try I Can Never See the Light”**
- **“If Math Were an Animal It Would a Wolverine Ready to Slash My Grades”**
- **“If Math Were a Food, It Would be Dog food”**

Engagement Trumps Everything

What is Worthwhile to Learn and How it is Taught Gets Students' Attention

High School Student's Motivation to Learn Math at One School N= 1300



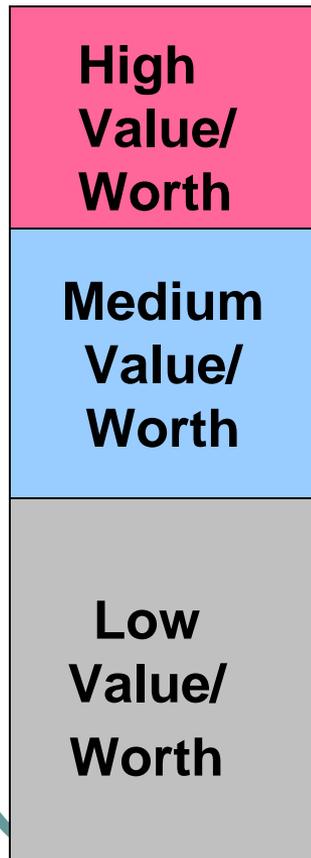
Not All Standards Are Created Equal:

What Is Rigorous is Not Necessarily What Is Worthwhile

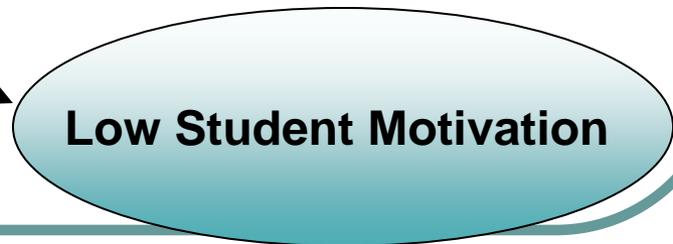
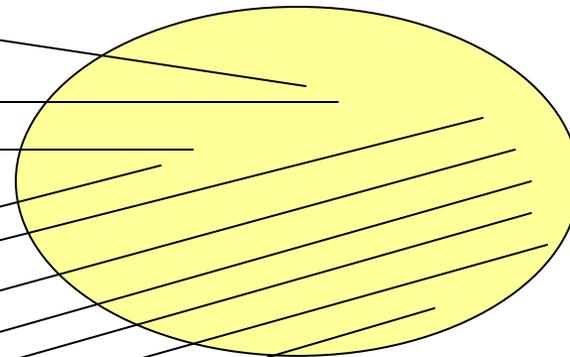
- At your table, each of you has a math standard that was taken from an actual state's standards
- A group of math teachers picked 1 or 2 of these standards as the most important for their students to learn by the end of 4 years
- Your task in the next ten minutes is to try to reach consensus at your table as to what you value as the 1 or 2 most important standards for **you** to have learned

Assessments Trump Standards: What Gets Tested Gets Taught

State Standards

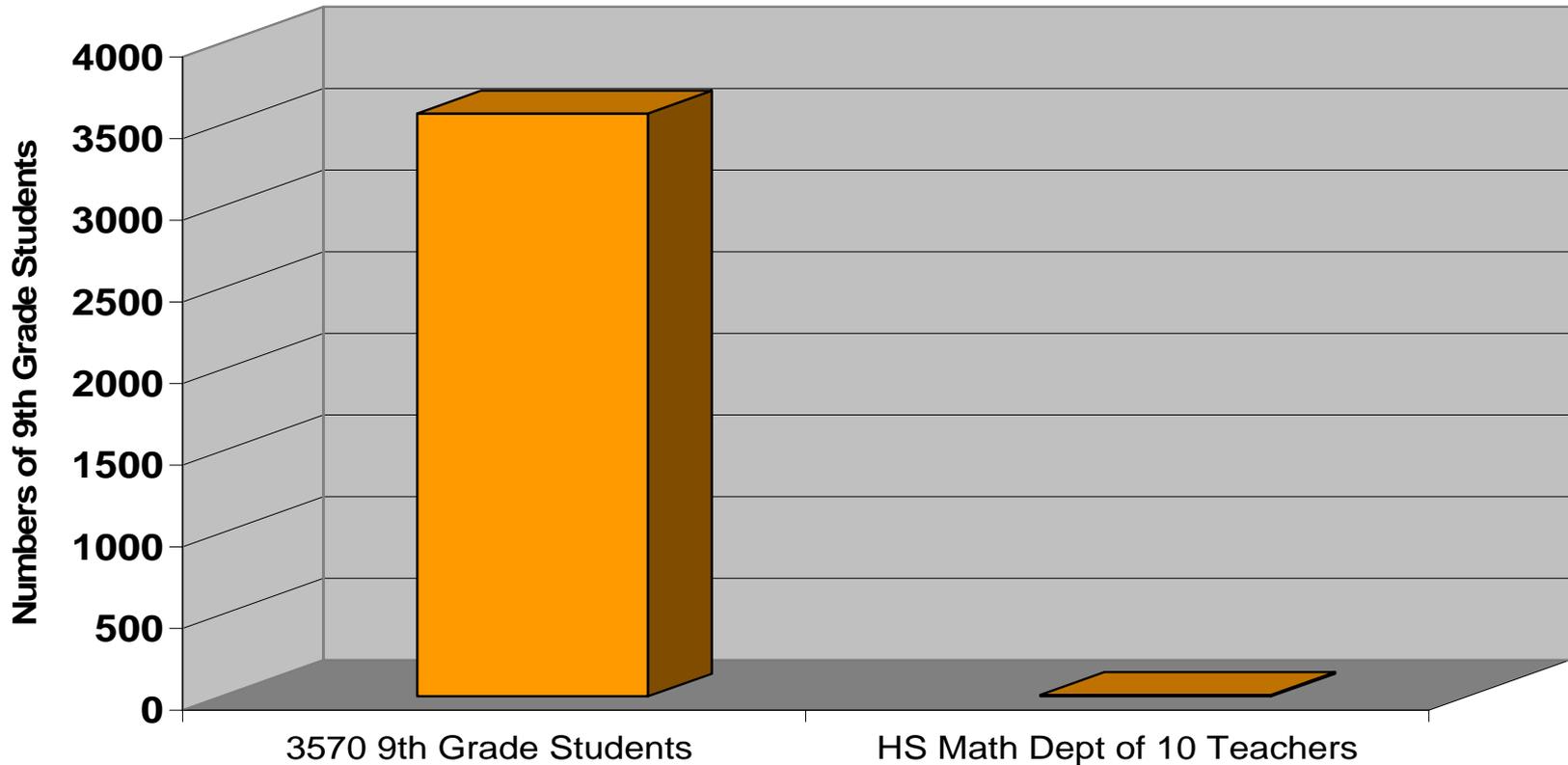


State Assessments



Who are the “Customers” And What Do They Want?

Number of 9th Grade Students to Get 10 Math Department Teachers

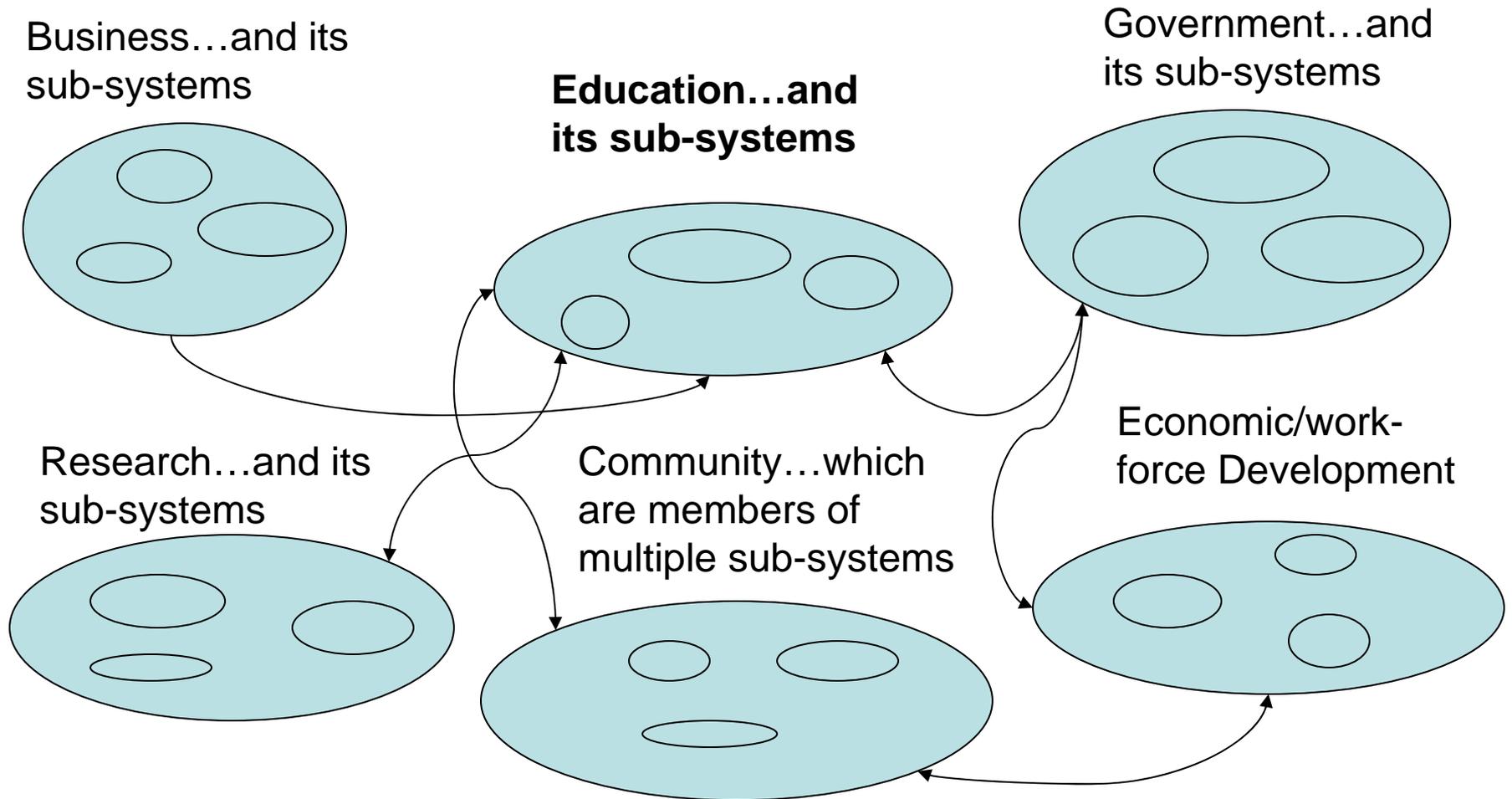


High Value Standards as Defined by the “Customer”

- The Challenge for All of Us —Multiple Customers...
 - Business
 - Higher Education
 - Departments of Education
 - Parents
 - Students
- ...in multiple systems...with a cacophony of views

Regional Stakeholders Need to be Heard to Help Redesign the K-16 System Around High Value High Priority Learning Goals

Innovation Ecosystem...a series of subsystems—all with cultural idiosyncrasies and nuances



The Regional Compact

- Genesis--Dialogue
- What is the Compact?
- Partners
- Core Values
- Unfunded

Genesis of Greater Philadelphia Regional Compact for STEM Education

| | |
|----------------|--|
| March 2006 | Business, Higher Education K-12 STEM Summit held |
| June 2006 | DVIRC STEM Forum—A Dialogue for Action held |
| July 2006 | Philadelphia Math Science Coalition Strategic Plan |
| October 2006 | STEM Forum Proceedings published |
| Dec 2006 | Regional Compact for STEM Education Drafted |
| Feb 2007 | 1 st Engineering Deans Meeting |
| March 2007 | Draft Regional Compact for STEM Education released |
| April 26, 2007 | 2 nd Annual Spring Forum - STEM Planning Conference |
| May 2007 | Regional Compact Signed |
| June 2007 | Commonwealth STEM Center NGA Proposal submitted |
| July 2007 | Commonwealth NGA Award announced |
| December 2007 | 1 st Arts & Sciences & Education Deans Meeting |

The Regional Compact—What is it?

- **An Agreement to Work Together for STEM Education with a focus on integrating STEM Education and Research with Economic Development**
 - **Promote**
 - **Advocate**
 - **Articulate**
 - **Share**

Partners

- MSPGP
- DVIRC
- Philadelphia Education Fund (PMSC)
- Ben Franklin Technology Partners
- Select Greater Philadelphia
- WHY Y

Core Values of Compact Partners

- Building social capital (trust)
- Distributed Leadership
- Consensus-oriented
- Information sharing
- Systems approach
- Based on Research and Data

NGA/Team Pennsylvania STEM Center Initiative



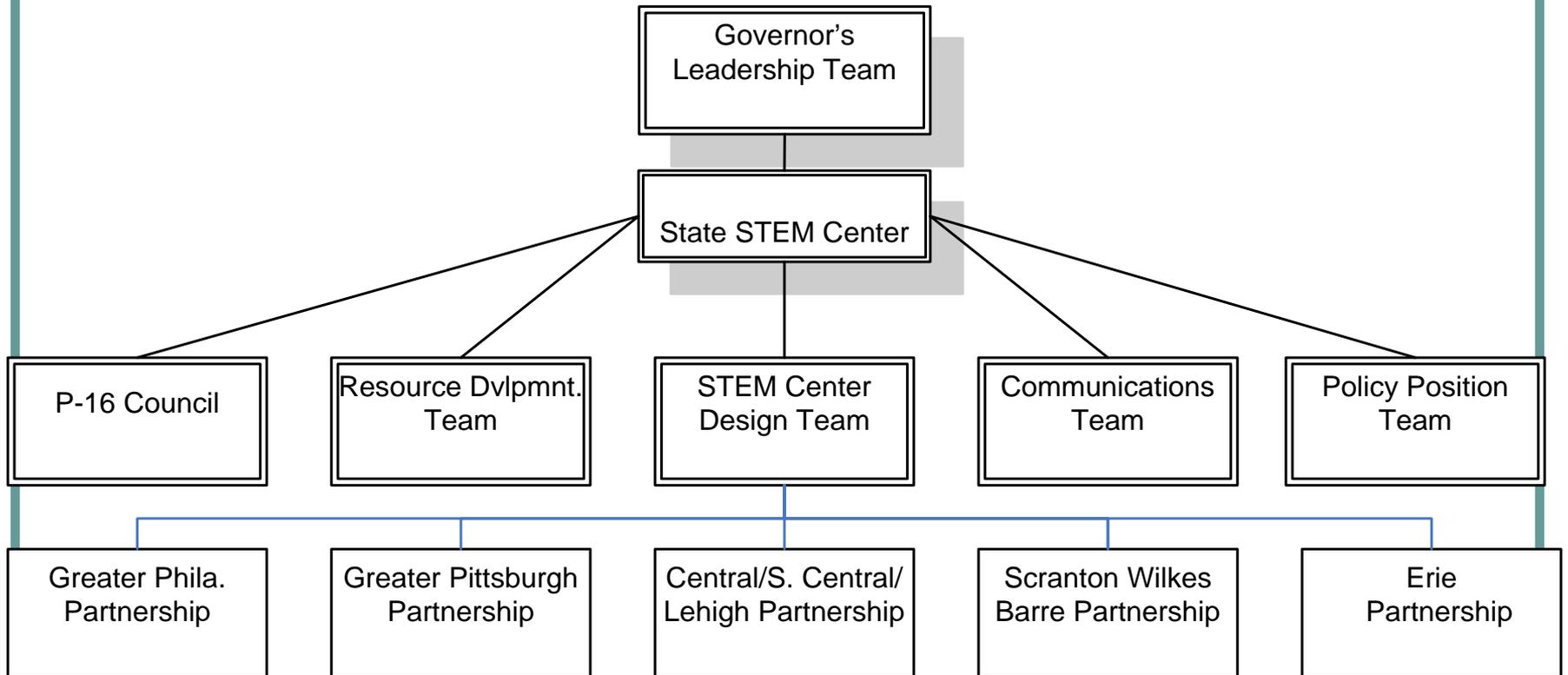
PA STEM Center Network

- Mission
- Structure
- Gap Analysis
- The Blank Slate
- Regional STEM Center Development
- Alignment & Connectivity (opportunities abound)
- Policy and Practice (data driven)
- Communications

Mission

- *Motivate and prepare more K-12 students, especially minorities and females, for careers in science, technology, engineering and mathematics while continuing the development of effective strategies to retain, recruit and retrain our incumbent workforce*

Structure



Gap Analysis—points to opportunity

- Coordinate investments/activities across agencies
- Focused process & outcome metrics
- Replication of successful best practices
- Quality, Quantity, diversity of STEM teacher talent pool
- Coordination of Federal, State and Regional efforts
- Conduct action research to adopt & use only data-based practices
- Communication among all Stakeholders
- Deliberate **creation of a “learning community”**

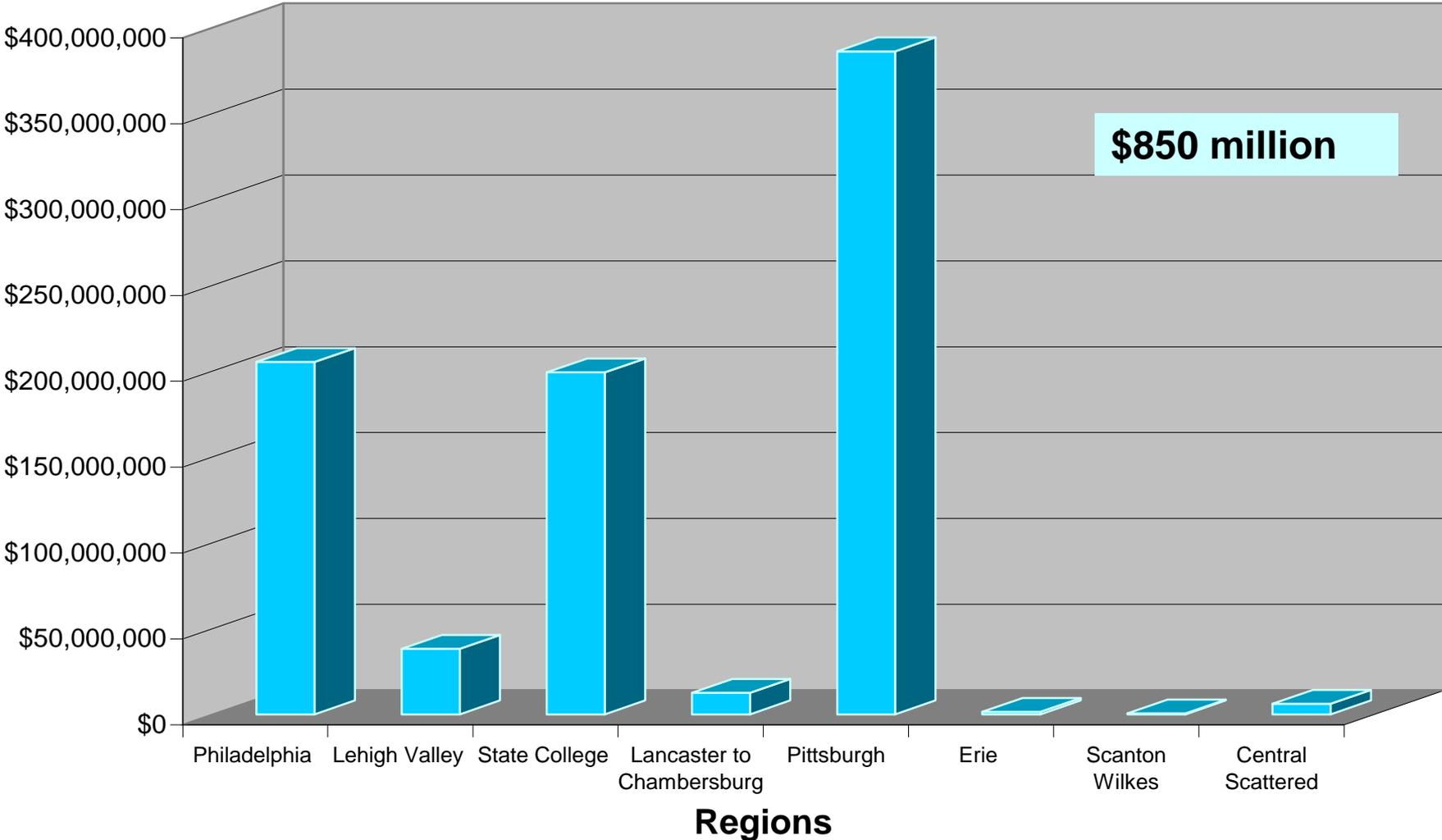
There is no Blank Slate

- PA Department of Education
- Teacher Certification
- Tests and Standards
- Educational & Workforce Development Initiatives
- District & School Initiatives
- Multiple Disconnected Innovations

Regional STEM Center Development

- Regional Centers—Compact Development
- Regional Guidelines (under development)—*Thank you Georgia!*
- Four Stages of Development
 - **Stage 1** Identify and Engage Various Stakeholders (Customers) in Dialog About Regional Priorities, Challenges, Solutions – Compact Formation
 - **Stage 2:** Asset Mapping, Communication Strategy, Goal Setting for System Improvement, Developing Metrics For Progress, Planning for Stage 3
 - **Stage 3:** Resource Development and Best Practice Adoption
 - **Stage 4:** Continuous Improvement

Active NSF Grants to PA as of 2007 in Dollars



Connectivity

- Culture is King—Social Capital Makes Leadership Possible and More Productive
- Regional Compacts Created from Social Capital, using Distributed Leadership, drawn from Mapped Assets, Based on Research and Data, is a Potent Force for STEM Educational Progress
- Systems Change...and so...

State STEM Center—10 years out

- Align and enhance coordination of existing state and regional STEM education programs/resources
- Improve the quality of STEM curricula and teaching and the ability of schools and districts to lead reforms that result in STEM literacy for all students
- Prepare and motivate more students to pursue learning and career exploration within STEM pathways
- Align the Commonwealth's P-16 STEM education standards and assessments with workforce needs
- Expand the skilled STEM workforce by increasing the number of STEM majors/courses in community and four-year colleges, and industry training opportunities

Regional Vision...in 10 years...

- Premier Region in the Business of Making Things
- Innovation is part of the regional ethos
- Annual investment in STEM Education exceeds the national average
- Businesses fight to locate in our region
- Regional STEM Center viewed as an economic development asset
- Regional economic and education systems are known for their efficiencies
- All citizens are participating in the Innovation Economy
- And...the sky's the limit...