STEM LEARNING ECOSYSTEMS

Lessons Learned from 89 Communities Around the World
TIES as a Strategic Advisor

STEM Design

STEM Learning Ecosystems

Digital Fabrication and Innovation Labs

Philanthropy and Social Impact

STEM Talent
ECOSYSTEMS

The Big Idea...
“STEM learning ecosystems harness the contributions of educators, policymakers, families, businesses, informal science institutions, afterschool and summer providers, higher education, and many others towards a comprehensive vision of science, technology, engineering, and math (STEM) learning for all.”

Assessing the impacts of STEM Learning Ecosystems (Traill and Traphagen, 2015)
WHY ECOSYSTEMS?

STEM ecosystems
Cultivate. Learn. Innovate.

STEM Funders Network
powered by TIES
Uniting Partners. Transforming Learning.
Global Societal Challenges

• Level 1
  • Climate Change
  • Water Scarcity
  • Energy Security
  • Cyber Security
  • Global financial structure
  • Biodiversity and Ecosystem losses
  • Fisheries Depletion
  • Deforestation
  • Infectious Disease

• Level 2
  • Poverty
  • Education
  • The Digital Divide
  • Urbanization
  • Intellectual property
  • International labor and migration
  • E-Commerce rules
  • Biotechnology rules
  • Maritime Safety and Pollution

Eliminate our way of life
Disruptive to our way of life

Credit: Gregory Washington, PhD, Dean, Samueli School of Engineering, University of California, Irvine
ECOSYSTEM HISTORY

The Beginning...
Research and Evidence of STEM Ecosystems

1990s

1990s-2009

1/2010 - 7/2011

2011-13

2011 - 2013

LIFELONG AND LIFEWIDE LEARNING

9.25%

16 WAKING HOURS

18.5%

7.7%

5.1%

0-5 K  GR 1-12  UG GRAD  WORK  RETIREMENT

FORMAL LEARNING ENVIRONMENTS

INFORMAL LEARNING ENVIRONMENTS
...providing the architecture for all sectors to align opportunities for all learners to develop the skill sets necessary to thrive in a 21st century economy and beyond.
“No single individual or organization can influence the entire ecosystem alone.”

“There is no one solution that will create progress at scale.”
The World is Complex.

We figure it out together.

STEM Ecosystems reimagine learning for the future.
1. **Opportunity-Based:**
   Discovering overlapping interests

2. **Collaborative:**
   Joining Forces

3. **Interconnected:**
   Developing and inclusive system

4. **Transformational:**
   Changing all partners

Partnerships to Transform STEM Learning (Noam & Tillinger, 2004)
Establish and sustain cross-sector partnerships

Create and connect STEM-rich learning environments in diverse settings

Equip educators to lead active learning in diverse settings

Support youth to access pathways and exploration to further learning and careers

*Partnerships to Transform STEM Learning* (Noam & Tillinger, 2004)
# STEM Learning Ecosystem Elements

## Key Partners
1. PreK-12 school system receptive to external partnerships
2. High-quality after school programs
3. Out-of-school STEM-rich programs such as expert museums, science centers,
4. Institutions of higher education
5. Private sector STEM-focused businesses
6. Parent and community-based organizations

## Critical Attributes
1. Anchored by a passionate leader(s) with a collaborative vision and practice
2. Attentive to the enlightened self-interest of all partners
3. Philanthropic and public sector support, and in-kind resources

## Focus Areas
1. Building the capacity of educators in all sectors.
2. Equipping educators with tools and structures to enable sustained collaboration.
4. Creating learning progressions that connect and deepen STEM experiences over time.
5. Focusing instruction on inquiry, project-based learning and real-world connections to increase relevance.
7. Exposing young people to potential STEM careers.
A perfect place in numbers

1 school district  $500,000 energy savings per year  1 partnership

Installed solar panels produce energy equal to planting 141.5 acres of trees and letting them grow for ten years

3,750 students per year

Collaborative teaching in flexible spaces

Goal: 100% student engagement

SIEMENS
Selected Findings

• **Partnerships** (+188%)

• **Funding** (+7,357%)

• **Engagement in STEM**
  - Youth (>170,000 in 2017)
  - Educators (>1,200 in PD in 2017)
  - Mentors (>200 in 2017)

• **Programming quality**

• **Youth and educator attitudes**

“...all sectors, from community, government, k-12, funders, business [came together], and the topic was what was going on in STEM in our area, what needs to be going on, what can we do that doesn't duplicate other efforts.”
NSF INCLUDES
POLICY WINS
Delran gets jump-start on federal STEM recommendation

Delran schools host Tammy Murphy to advocate for sustainability curriculum

Congressman Andy Kim
about 8 months ago

Last night was the grand opening of the Delran Township Digital Innovation and Fabrication Laboratory. This partnership between Delran High School and the Delran STEM Ecosystem Alliance is going to put Burlington County on the forefront of innovation and prepare our community to lead the future.

The students I met with were so impressive and a great reminder of the bright future we have ahead of us.

Representatives from Delran businesses, government and education toured the greenhouse of the local high school in March 2018 to see the work they were supporting as members of the Delran STEM Ecosystem Alliance. The federal government last month recommended that schools join these partnerships, called ecosystems, to further STEM education. [ARCHIVE PHOTO]
Education - We believe learning happens everywhere and we’ve adopted a fresh approach.

Workforce - We bring together industry leaders to identify skills for an economy yet to be conceived.

Systems Change - We champion informed policies to meet 21st century needs by partnering with lawmakers, public officials and other influencers.
Thank you!

Contact me: veronicagonzales@tiesteach.org
408.656.3044

@STEMecosystems