SYSTEMS ENGINEERING RESEARCH CENTER

Policy Options to Promote DoD-Defense Industry Collaboration in Stem Education and Workforce Development Programs, Activities, and Outreach

WRT 1055

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Outline

- A Case for Action by DoD and its Industrial Base
- Creating Pathways to Develop the Technical Workforce for Defense Missions
- Setting the Conditions for Success—*Collective Impact*
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A Case for Action by DoD and its Industrial Base

- A ***skilled STEM workforce is especially critical*** in a defense-focused industrial strategy, which requires innovative and bold solutions and production and integration of complex systems

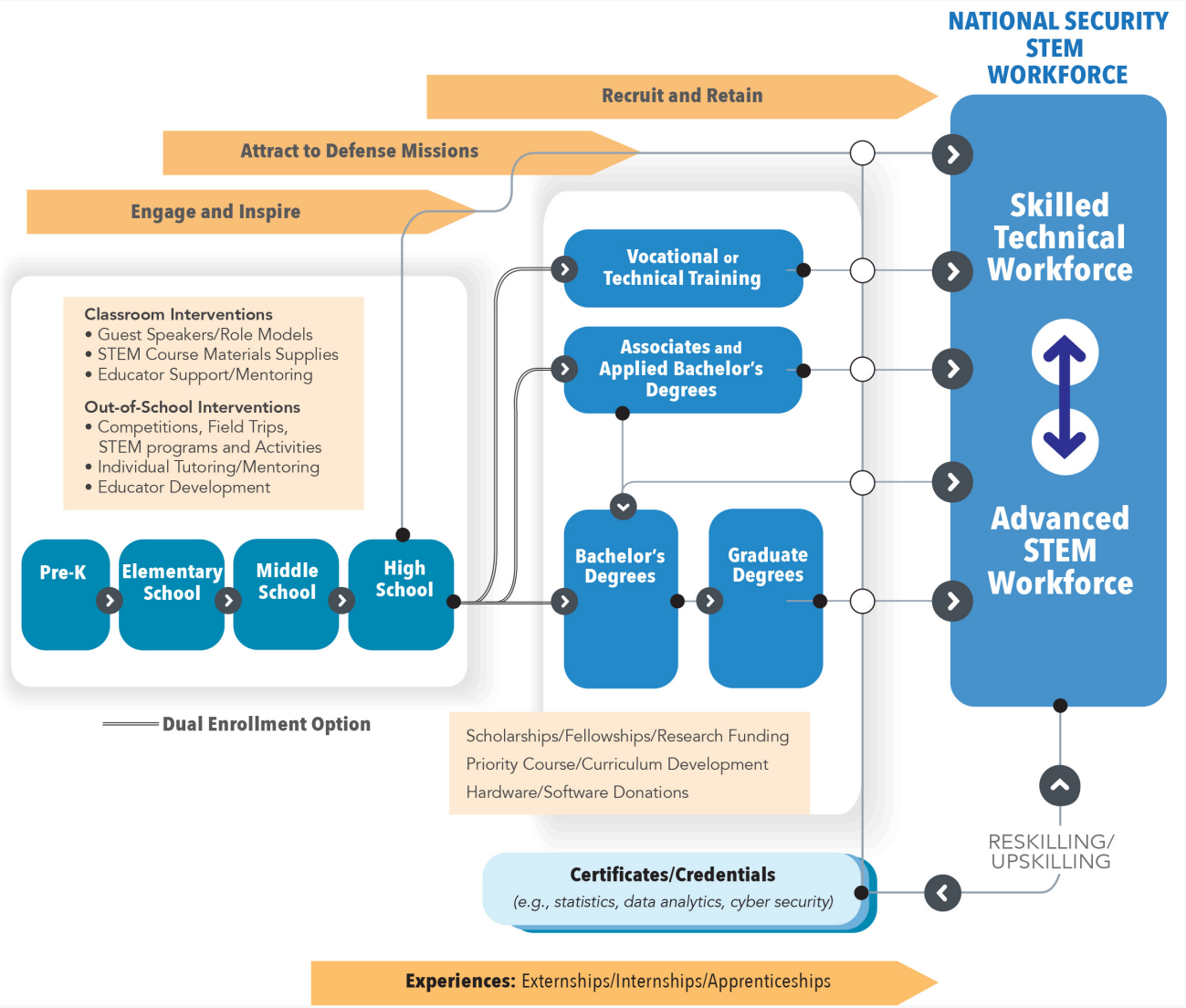
- DoD and the DIB have a ***common mission*** and ***shared strategic risks*** stemming from projected shortfalls in the workforce needed to support defense missions

- DoD and DIB technical personnel are uniquely qualified to ***engage***, ***inspire***, and ***attract*** future generations of talent to pursue careers in support of defense missions

- DoD and the DIB, working together, can create the ***educational pathways*** needed to develop the technical skills needed to support ***evolving defense mission needs***

- DoD and the DIB, working together, can establish a ***sustainable system*** that ***improves outcomes***, ***amplifies impacts***, and ***enables ongoing assessment*** of their collective efforts toward developing the clearable STEM workforce for defense missions

Creating Pathways: Technical Workforce for Defense Missions



Critical Roles for DoD/DIB

- **Engage and Inspire**
  - Military-connected
  - Other Priority Populations
- **Attract to Defense Missions**
  - Role Models
  - Mission-related Interventions
  - Scholarships/Fellowships
- **Recruit and Retain**
  - Mission-related Experiences
  - Mission-relevant Curriculum
  - Reskilling and Upskilling

Collective Impact: Setting the Conditions for Success

THE FIVE CONDITIONS OF COLLECTIVE IMPACT	
Common Agenda	All participants have a shared vision for change including a common understanding of the problem and a joint approach to solving it through agreed upon actions.
Shared Measurement	Collecting data and measuring results consistently across all participants ensures efforts remain aligned and participants hold each other accountable.
Mutually Reinforcing Activities	Participant activities must be differentiated while still being coordinated through a mutually reinforcing plan of action.
Continuous Communication	Consistent and open communications is needed across the many players to build trust, assure mutual objectives, and create common motivation.
Backbone Support	Creating and managing collective impact requires a separate organization(s) with staff and a specific set of skills to serve as the backbone for the entire initiative and coordinate participating organizations and agencies.

Source: Stanford Social Innovation Review (2011)

Three Preconditions

1) ***Influential champion (or a small group of champions)***
2) ***Adequate financial resources***
3) ***Sense of urgency for change***

Isolated Impact vs Collective Impact

Isolated Impact vs. Collective Impact	
Isolated Impact	**Collective Impact**
▪ Funders select individual grantees that offer the most promising solutions ▪ Nonprofits work separately and compete to produce the greatest independent impact ▪ Evaluation attempts to isolate a particular organization's impact ▪ Large scale change is assumed to depend on scaling a single organization ▪ Corporate and government sectors are often disconnected from the efforts of foundations and nonprofits	• Funders and implementers understand that social problems, and their solutions, arise from the interaction of many organizations within a larger system • Progress depends on working toward the same goal and measuring the same things • Large scale impact depends on increasing cross-sector alignment and learning among many organizations • Corporate and government sectors are essential partners • Organizations actively coordinate their action and share lessons learned

Source: Stanford Social Innovation Review (2011)

DoD and DIB organizations are today largely operating in the 'Isolated Impact' mode

This study recommends transition toward 'Collective Impact'

About this Study: FY2020 NDAA: House Report 116-333

- Conferees note the importance of developing a world class cadre of technical talent for STEM job functions, including a number which require security clearances

- Conferees believe that a strong partnership between the defense industry and DoD can stimulate efforts to increase that pool

- Conferees direct Secretary of Defense to commission study to develop policy options and recommendations to **promote DoD-defense industry collaborations**
    - Create clearable technical workforce to meet defense missions
    - Support educational opportunities for defense sector personnel
    - Increase educational opportunities for veterans and military dependents
    - Emphasize activities based on metrics and education best practices

Information Gathering

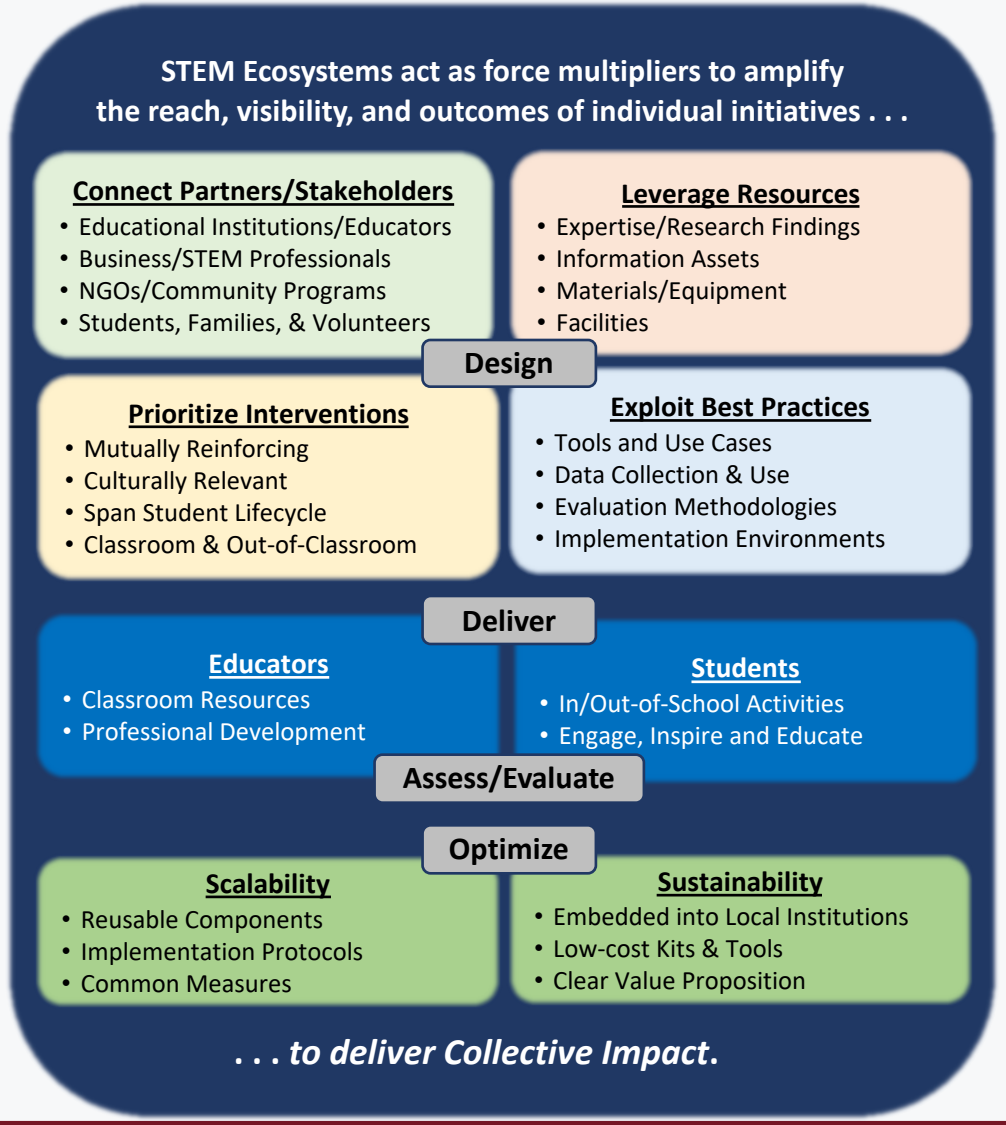
- Phase 1—Interim Report
  - Understanding the landscape of STEM-related activities supported by DoD and the DIB
    - Online survey supplemented by web-based research for sample population of 906 DIB organizations
    - Discussions with leadership of DoD STEM activities
  - Discussions with selected external organizations engaged in relevant STEM activities
  - Literature reviews to better understand the importance of a STEM-competent workforce for defense missions and STEM ecosystem models

- Phase 2—Final Report
  - Targeted discussions with DoD leadership and program managers
  - Discussions with DIB leadership
  - Outreach to defense-related professional organizations
  - Discussions with subject matter experts in areas including evaluation and assessment of STEM activities
  - In-depth literature review augmented by a workshop focused on the Skilled Technical Workforce

Key Take-Aways from Research

- DoD-DIB **collaboration on STEM education-related activities is rare**, although the scope and scale of STEM interventions by both DoD and DIB organizations is vast
  - Collaborations *do exist* in the area of manufacturing/industrial workforce development
  - Incentives must be aligned to create an environment conducive to meaningful collaboration
- The **Skilled Technical Workforce (STW) is of growing importance** but not well understood
  - Nascent efforts are underway to characterize the manufacturing-related STW
  - Needs extend beyond that domain
- Few STEM initiatives directly target building a clearable technical workforce
  - Although both DoD and DIB organizations do emphasize engagement with military-connected families
- Opportunities exist to **leverage ongoing activities within existing STEM ecosystems**
  - But DoD and DIB organizations have a *differentiated role that cannot be ceded* to those efforts
- **Evaluation/assessment methodologies identified are inadequate** for measuring Collective Impact

STEM Ecosystems: A Vision for DoD-DIB Collaboration



Vision for DoD-DIB Collaboration

. . .a DoD-DIB collaboratively-operated system of local DoD-DIB nonprofit organizations, each of which is a fully-participating partner within an existing STEM ecosystem.

The DoD-DIB partnership will emphasize:

- ***outreach to priority populations;***
- ***engaging, inspiring and attracting students to defense missions;***
- ***introduction of high-priority STW pathways;***
- ***other jointly-established strategic priorities.***

Overview of Study Recommendations

Recommendations

Building a Clearable Technical Workforce

- Retain Cleared Talent
- Prioritize Programs with Strong Links to U.S. Citizens
- Build Bridges to the Potential National Security STEM Workforce
- Increase Engagement of the Skilled Technical Workforce

Creating Incentives for DoD-DIB Collaboration

- Executive Messaging – 'Tone at the top'
- Financial Incentives to Drive Behaviors
- Branding Incentives to Drive Behaviors
- Small Business Incentives

Advancing STEM/STW Ecosystems

- DoD-DIB Collaboration in STEM/STW Ecosystems
- Evaluating Collective Impact
- Leveraging Nonprofit Organizations
- Models for Systemic Change
- Exploiting the Virtual Environment

Recommendations: Building a Clearable Tech Workforce (1)

Building a Clearable Technical Workforce	
Retain Cleared Talent	
Key Points	Recommendation
Cost of replacing an employee can range from one-half to two times the employee's annual salary. Retention of the current cleared workforce must be a clear priority.	***The DoD (and DIB) should invest in cleared-workforce retention through leadership training, promotion of flexible work environments, up-skilling and re-skilling efforts, and competitive compensation.***
Prioritize Programs with Strong Links to U.S. Citizens	
Key Points	Recommendations
<u>JROTC</u> Instructor eligibility restrictions and compensation challenges have contributed to a critical shortage of instructors. JROTC is budget- and resource-constrained. Increased coordination would enable JROTC units to leverage existing STEM resources.	***DoD should support JROTC proposals for pay and eligibility to facilitate recruitment and retention of STEM-competent instructors.*** ***DoD and the DIB should jointly establish a collaborative nonprofit to support ongoing STEM engagement efforts as well as enable program expansion.*** ***DoD STEM should support and enable increased inter- and intra-service coordination to amplify the Department's overall STEM engagement with JROTC programs.***

Recommendations: Building a Clearable Tech Workforce (2)

Building a Clearable Technical Workforce	
Prioritize Programs with Strong Links to U.S. Citizens	
Key Points	Recommendations
<u>Veterans Programs</u> DIB engagement could provide GI Bill beneficiaries with valuable work-based training and professional experiences. VET TECH, which supports educational pathways to the STW, would benefit from additional DIB engagement.	***The DoD, in collaboration with the DIB, should seek to increase and facilitate internship opportunities for GI Bill beneficiaries in STEM/STW fields.*** ***The DoD should seek to support the VET TEC program by fostering increased DIB involvement in the program's employer consortium.***
<u>DoD Military Academies</u> Prioritize investments through additional STEM resources, providing guest lecturers, sponsoring STEM competitions, etc.	***DoD STEM should prioritize partnerships with College Prep Military Schools, Senior Military Academies, Federal Service Academies, and DoD Postgraduate Schools as a means to expand the clearable technical workforce.***
<u>Military Dependent Programs</u> DoDEA system has limitations with regard to its ability to benefit from industry engagement.	***DoD STEM should seek ways to support DoDEA STEM through activities such as internships, competitions, and guest speakers (both in-person and virtual).***
<u>HBCU/MSI Engagement</u> HBCUs and MSIs tend to attract a higher ratio of U.S. citizens. HBCUs and MSIs are already a priority for DoD STEM.	***STEM Program Managers and DoD agencies should continue to prioritize investments in HBCUs and MSIs through research funding, internships, and partnerships.***

Recommendations: Building a Clearable Tech Workforce (3)

Building a Clearable Technical Workforce	
Build Bridges to the Potential National Security STEM Workforce	
Key Points	Recommendations
<u>Internships</u> Current recruiting and hiring systems are fragmented across DoD, Services, and Defense Agencies. DoD would benefit from having a consistent way to engage with the entire population. Prospective interns would benefit from better awareness of the array of opportunities available.	***DoD STEM should lead a collaborative effort to build an Intern Portal that communicates all available opportunities; provides a single application process; supports tracking of interns; and enables communications to the entire intern pool to expand awareness of career opportunities within DoD.***
<u>Advocacy Networks</u> Advocates work with students to increase awareness of career opportunities. Experienced advocates include retired military or civilian defense leaders.	***Stewards of STEM programs should support and expand advocacy networks (e.g., between university students and experienced advocates) as a way to grow the pipeline of cleared workers for defense missions.***
<u>Public-Facing Strategic Partnerships</u> The work that goes on inside defense installations is opaque to the general public (including prospective employees)	***DoD should increase efforts to build a public-facing presence outside of security perimeters to engage with the public on innovative R&D topics and other aspects of defense missions.***

Recommendations: Building a Clearable Tech Workforce (4)

Building a Clearable Technical Workforce	
Increase Engagement of the Skilled Technical Workforce	
Key Points	Recommendations
STW is more diverse than the remainder of the STEM workforce. STW is poorly understood from a workforce planning perspective. STW development programs sponsored by DoD emphasize manufacturing skills; needs exist across defense missions more broadly. Veterans and transitioning service members would benefit from a more coherent way to translate their experience to civilian workforce opportunities.	***DoD and DIB should jointly develop a comprehensive dataset describing the defense-related STW (current state, future projections, pathways, skills, competencies) to inform policies that support increasing STW engagement.*** ***DoD and DIB should work jointly to establish pilot programs, in collaboration with Community Colleges and Technical Institutes, for high-priority emerging fields underserved by existing workforce development efforts.*** ***DoD should lead a coordination effort to address skills/competencies classification and translation challenges for transitioning service members seeking to join the STW.***

Recommendations: Creating Incentives for Collaboration (1)

Creating Incentives for DoD-DIB Collaboration	
Executive Messaging – 'Tone at the top'	
Key Points	Recommendation
There is no more powerful force for motivating collaboration than an explicit statement from the highest organizational levels about its importance.	***Senior DoD leadership should publicly state a desire to see DoD-DIB collaborative partnerships formed to advance STEM-education related activities.***
Financial Incentives to Drive Behaviors	
Key Points	Recommendations
Participation in DoD-DIB collaborative partnerships should be financially attractive to industry as well as in the best budgetary interest of DoD STEM offices.	***DIB investments in approved collaborative partnerships for STEM education-related activities should be enumerated in the FAR as an allowable expense for reimbursement in contract rates.*** ***DoD STEM budgets should prioritize engaging in approved collaborative partnerships with the DIB.***

Recommendations: Creating Incentives for Collaboration (2)

Creating Incentives for DoD-DIB Collaboration	
Branding Incentives to Drive Behaviors	
Key Points	Recommendation
Awards programs can heighten brand visibility both locally and nationally. Example programs include Baldridge Awards, Program Excellence Awards. Awards program should recognize successful DoD-DIB collaborative partnerships.	***DoD and the DIB should establish a national awards program for excellence in DoD-DIB collaborative partnerships advancing STEM in support of defense missions.***
Small Business Incentives	
Key Points	Recommendations
Small businesses rely heavily on STEM/STW talent but are resource and budget-constrained.	***DoD should build on existing programs and structures (e.g., Mentor-Protégé and Procurement Technical Assistance Centers) to reduce the barriers to Small Business participation in STEM education activities.***

Recommendations: Advancing STEM/STW Ecosystems (1)

Advancing STEM/STW Ecosystems	
DoD-DIB Collaboration in STEM/STW Ecosystems	
Key Points	Recommendation
A platform is needed to enable DoD-DIB collaborative partnerships in which the two parties jointly set priorities and then plan, implement, and assess STEM education-related interventions. Report recommends the use of a nonprofit organization.	***DoD/DIB should jointly establish a 3-year (at least) pilot collaborative partnership within in an existing STEM ecosystem in which both are heavily invested as a way to determine the benefits of joint planning and implementation of STEM activities.***
Evaluating Collective Impact	
Key Points	Recommendations
Existing evaluation/assessment methodologies are inadequate. An opportunity exists to work with partners on-the-ground to pilot the evaluation/assessment framework provided in this report.	***DoD STEM should pilot the Collective Impact-aligned evaluation/ assessment framework within one (or more) of its existing hubs.***

Recommendations: Advancing STEM/STW Ecosystems (2)

Advancing STEM/STW Ecosystems	
Leveraging Nonprofit Organizations	
Key Points	Recommendation
Nonprofit organizations can provide differentiated value in STEM ecosystems; many such organizations exist. Decision criteria should include alignment with DoD-DIB priorities as well as financial outlook and organizational sustainability.	***Standard criteria should be used to inform the decisions of DoD-DIB collaborative partnerships regarding selection of nonprofit partner organizations; this report suggests criteria for use in selection of nonprofits that implement STEM interventions.***
Models for Systemic Change	
Key Points	Recommendations
The P-TECH 9-14 model provides an opportunity to bridge high school students seamlessly into 2-year post-secondary education. The model is widely used and proven effective.	***DoD STEM should, in collaboration with the DIB, leverage its partnerships with Community Colleges and Technical Institutes to implement the P-TECH 9-14 model to expand STW offerings of particular interest to the DoD and its industry base.***

Recommendations: Advancing STEM/STW Ecosystems (3)

Advancing STEM/STW Ecosystems	
Exploiting the Virtual Environment	
Key Points	Recommendation
A collective virtual environment would bring coherence to existing information and provide a valuable means to engage, inspire, and expand the STEM talent pool for defense missions.	***DoD STEM should lead the design and development of a Student/ Families portal based on existing information and activities implemented by the DoD, Military Branches, and Defense Agencies, as a pilot program.***

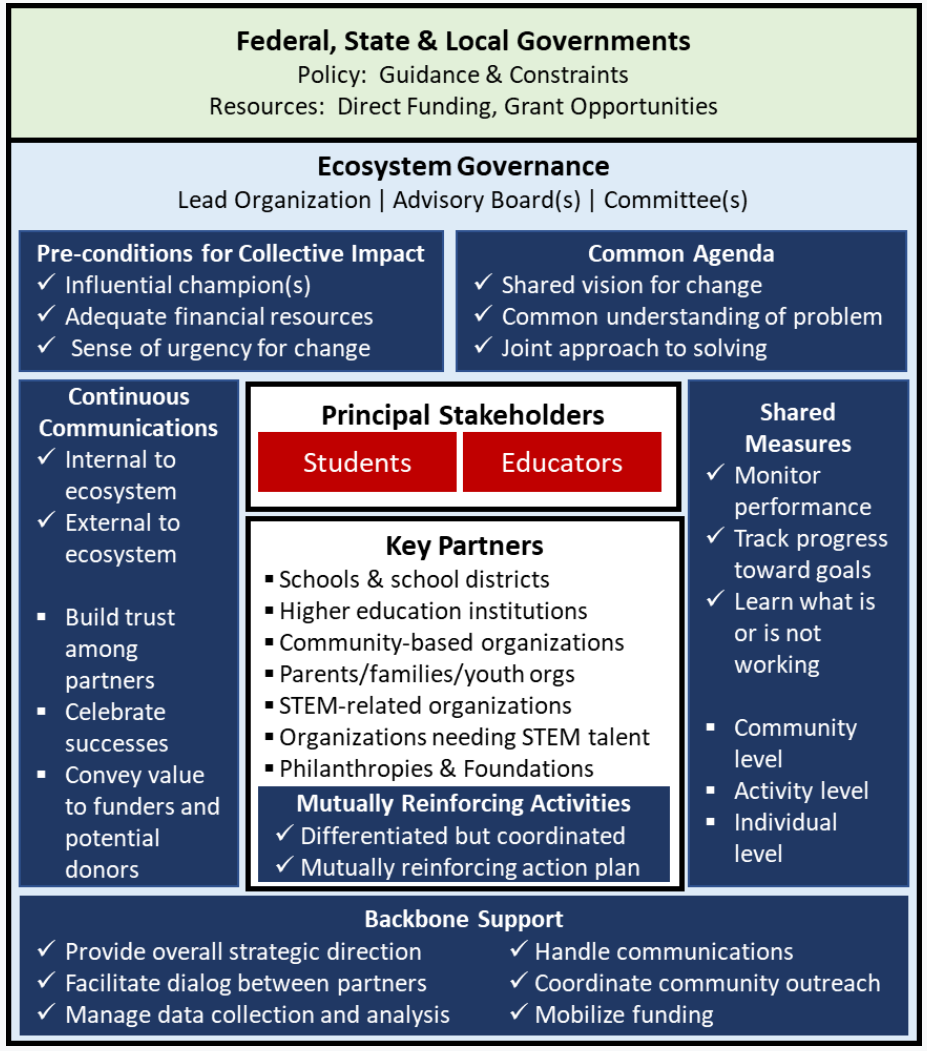
Recommendations: Creating Collective Impact

Five Conditions of Collective Impact	
Common Agenda	Interim: Address shared strategic risk (STEM/STW) via DoD-DIB Sector-Specific Plan Final: Comprehensive dataset for STW Both: Collaborative partnerships (joint planning)
Shared Measurement	Evaluation/assessment framework based on Collective Impact
Mutually Reinforcing Activities	Participation in STEM ecosystems (key attribute) Collaborative partnerships (synergies)
Continuous Communication	Participation in STEM ecosystems (key attribute) DoD-DIB System-of-(local) systems network Exploitation of the virtual environment
Backbone Support	Collaboratively operated system of local (nonprofit) DoD-DIB collaborative partnerships

Three Preconditions	
Influential Champions	DoD-DIB Chief Technology Officers Executive Messaging
Adequate Resources	Leverage available assets Base funding for nonprofits
Sense of Urgency	Shared strategic risk Existing talent shortfalls & projected increase in needs (high-demand skills)

The recommendations from this study are fully aligned with realization of Collective Impact

Preliminary Reference Architecture for Collective Impact



Beyond this Study

- More specific PreK-8 engagement strategies for clearable technical workforce
  - Current emphasis on secondary and post-secondary populations
  - Need to inspire, engage, diversify and expand feeder pipelines
- Prioritize participation in existing STEM ecosystems
  - Varying degrees of maturity and cohesion
  - Differing demographic populations reachable
  - Need to ensure alignment with DoD-DIB priorities
- Characterization of overall STEM/STW workforce needs
  - Incremental efforts underway relating to advanced manufacturing and emerging technologies
  - Need to develop a common lexicon (existing descriptions are outdated)
- Explore options to engage rural America and military-connected families living abroad

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