
The Evolving State of K-12 STEM Education in the US

Perspectives from the Interagency Working Group on Convergence

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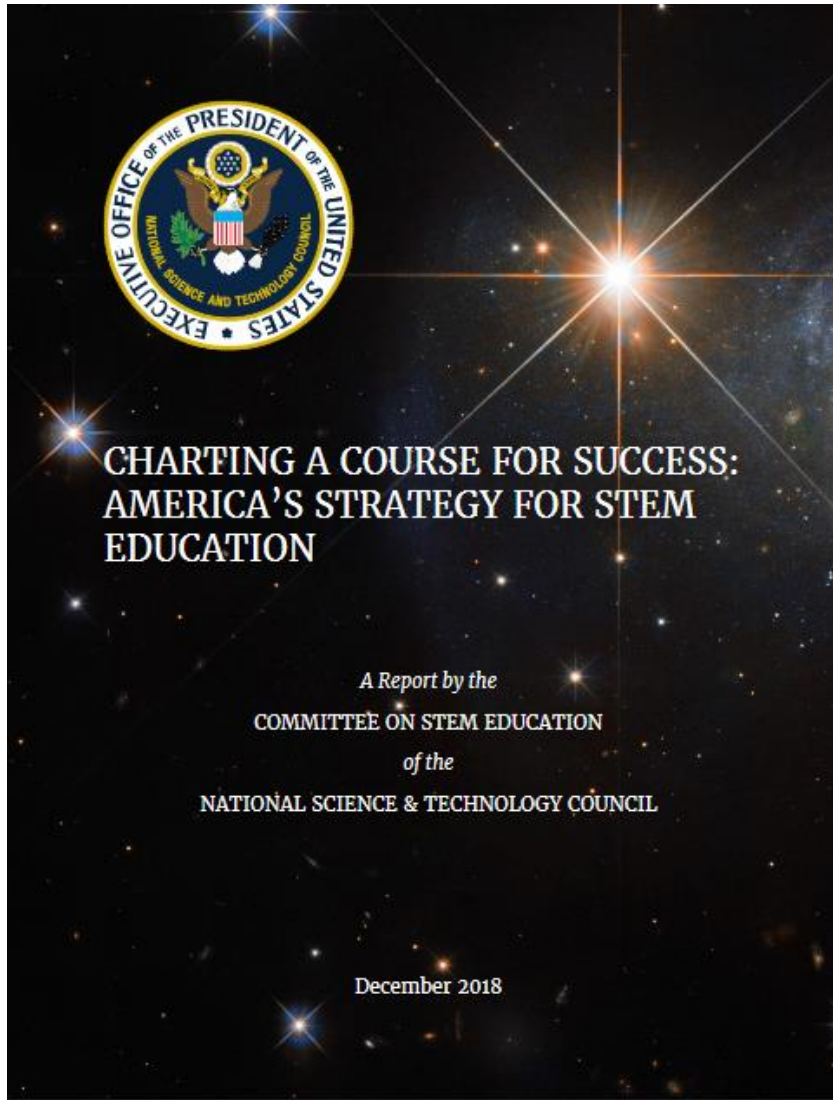
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BASIC RESEARCH OFFICE

GOVERNMENT-UNIVERSITY-INDUSTRY RESEARCH ROUNDTABLE

07 FEBRUARY 2024

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Why Convergence?

- In 2018, a **5-year Federal STEM Education Strategic Plan** was published that meets the requirements of Section 101 of the America COMPETES Reauthorization Act of 2010.
- The Strategic Plan was developed by the National Science and Technology Council's Committee on STEM Education (CoSTEM) and the White House Office of Science and Technology Policy (OSTP).
- ***Engaging students where disciplines converge*** is one of the four key pathways to achieve the vision and goals of the Strategic Plan.

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An Interagency Process



- CoSTEM's Federal Coordination in STEM (FC-STEM) Subcommittee agency representatives were instrumental in the Plan's drafting.
- Agency representatives also participate in the Interagency Working Group on Convergence who drafted the 2022 *Convergence Education* report.

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Included in the Report:

- General overview of the research on convergence education and the application of transdisciplinary learning to STEM education
- A pedagogical framework for convergence education
- Convergence education definition
- Characteristics, goals, and benefits of convergence education
- Recommended tools and processes for achieving convergence education
- A pathway to convergence education through STEM teaching, learning and assessment, including classroom examples of each
- Summary of promising and established practices, challenges, and barriers
- Recommendations for stakeholders



CONVERGENCE EDUCATION: A GUIDE TO TRANSDISCIPLINARY STEM LEARNING AND TEACHING

A Report by the
INTERAGENCY WORKING GROUP ON CONVERGENCE
FEDERAL COORDINATION IN STEM EDUCATION SUBCOMMITTEE
COMMITTEE ON STEM EDUCATION
of the
NATIONAL SCIENCE AND TECHNOLOGY COUNCIL

November 2022



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What Deep Scientific Questions and Societal Needs Do Our Students Face?



Level 1: Societal Needs

- Poverty
- Digital Divide
- Social Justice
- Education
- Migration
- Pandemic Prevention
- Scarce Natural Resources
- Maritime Safety
- Renewable Energy

Level 2: Deep Scientific Questions

- Climate Change
- Biodiversity Loss
- Infectious Disease
- Water Scarcity
- Energy Security
- Cyber Security
- Biotechnology
- Deforestation

How can we educate our students to understand the complex global socio-scientific issues of our time?

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What is Convergence Education?



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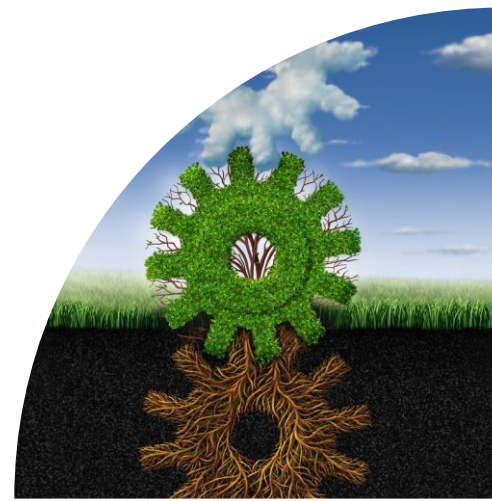
Convergence education, as **defined by the Interagency Working Group on Convergence**, is driven by compelling or complex socio-scientific problems or topics, where learners apply knowledge and skills using a blended approach across multiple disciplines (i.e. transdisciplinary) to create and innovate new solutions.

Source: OSTP. (2022). *Convergence Education: A Guide to Transdisciplinary STEM Learning and Teaching*. U.S. Government Public Domain Document (see 17 U.S.C. §105).

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Convergence Education....

PRIMARY CHARACTERISTICS



3. Is transdisciplinary

New frameworks, paradigms, or even disciplines can form across multiple communities.

2. Has deep integration across multiple disciplines

Complex socio-scientific problems cannot be solved by looking at them through one lens or mindset. Experts from different disciplines must work together and blend their knowledge, theories, expertise and data to create comprehensive solutions.

1. Is driven by a specific and compelling problem

Inspired by the need to address a specific challenge or opportunity. Whether it arises from deep scientific phenomena, engineering problems, or pressing societal needs.

Source: OSTP. (2022). *Convergence Education: A Guide to Transdisciplinary STEM Learning and Teaching*. U.S. Government Public Domain Document (see 17 U.S.C. §105).

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What do we mean by “transdisciplinary”?

Source: OSTP. (2022). *Convergence Education: A Guide to Transdisciplinary STEM Learning and Teaching*. U.S. Government Public Domain Document (see 17 U.S.C. §105).

Disciplinary



Multidisciplinary



Interdisciplinary



Transdisciplinary



Example Federal Resources to Support Convergence Education



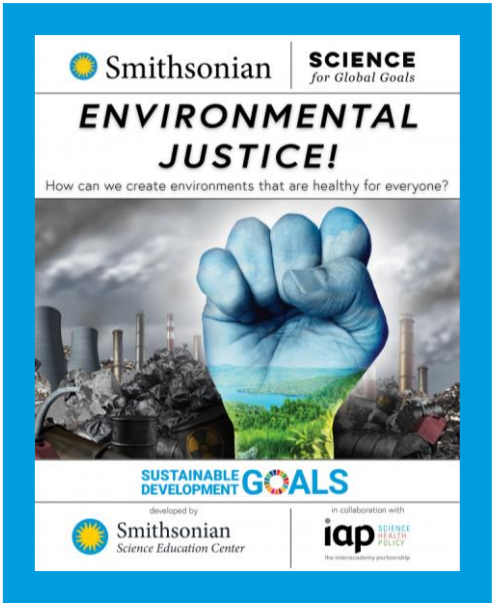
ED Education
Innovation &
Research
(EIR)

<https://oese.ed.gov/offices/office-of-discretionary-grants-support-services/innovation-early-learning/education-innovation-and-research-eir/>



<https://www.whitehouse.gov/ostp/news-updates/2023/01/26/readout-federal-interagency-working-group-on-convergence-webinar/>

The webinar recording is available to view at:
<https://youtube/60KA8HIKWvw>



<https://ssec.si.edu/global-goals>



<https://www.uspto.gov/kids/>

<https://equiphq.org>

Acknowledgements

IWG Convergence Members and Participants

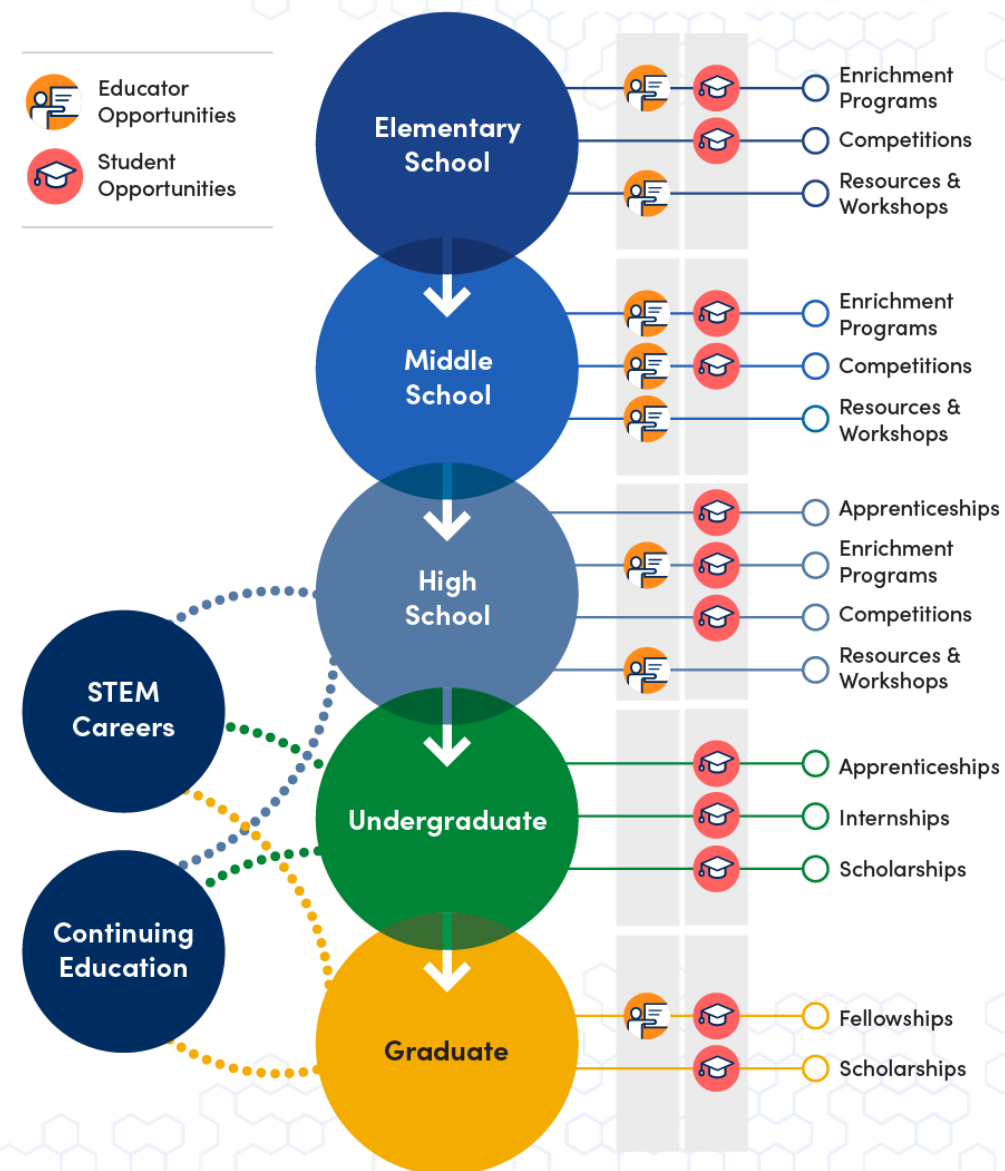
- Kelly Barford, DOD
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- Mary Lou O'Donnell, DOE
- Ping Ge, DOE
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- Robert Gabrys, NASA
- Susan Poland, NASA
- Louisa Koch, NOAA
- Arlene Destrul, NSF
- Chris Hill, NSF
- Deena Khalil, NSF
- Robert Mayes, NSF
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- Sarah Harris, USPTO
- Christine Nelson, USPTO
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- Joyce Ward, USPTO
- Cordelia Zecher, USPTO

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How do DoD STEM Programs support Convergence Education?

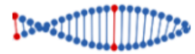
DoD STEM leverages scientists and engineers at Defense laboratories and Partner organizations to provide unique STEM learning experiences across the K-20 education continuum.

Opportunities include **enrichment activities, STEM camps, project/research-based competitions, internships, scholarships, and career development for educators and students.**



Why DoD STEM supports convergence education

DoD requires a transdisciplinary approach to DoD Critical Technology Areas



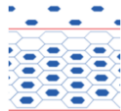
Biotechnology



Quantum Science



FutureG



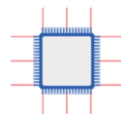
Advanced Materials



Trusted AI and Autonomy



Integrated Network
Systems-of-Systems



Microelectronics



Space Technology



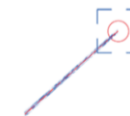
Renewable Energy
Generation and Storage



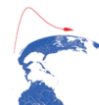
Advanced Computing and
Software



Human-Machine Interfaces



Directed Energy

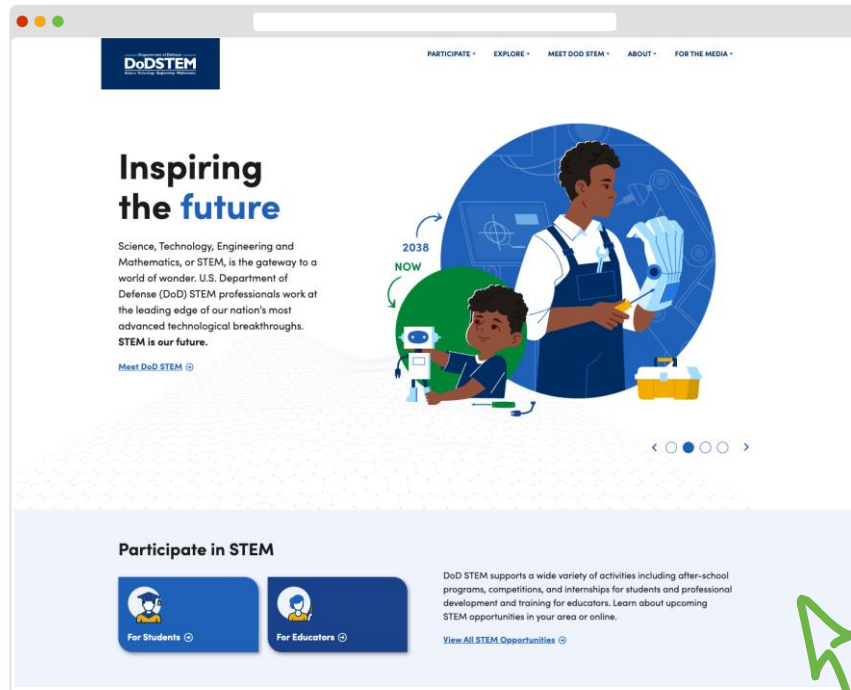


Hypersonics



Integrated Sensing and Cyber

Connect with DoD STEM



dodstem.us



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