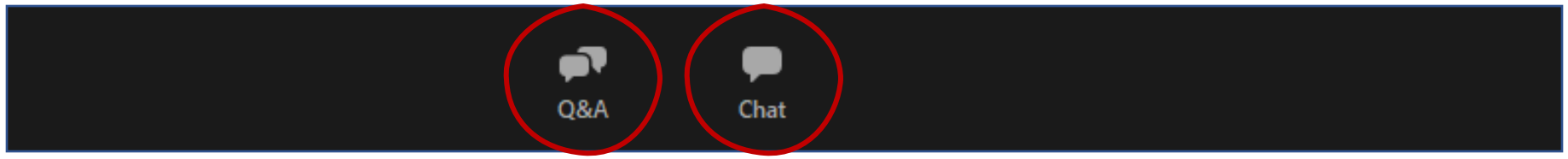
Welcome & Polls

Please type your name, organization, and role in the chat

Which STEM Career competency are you most excited to learn about?

Technical Information

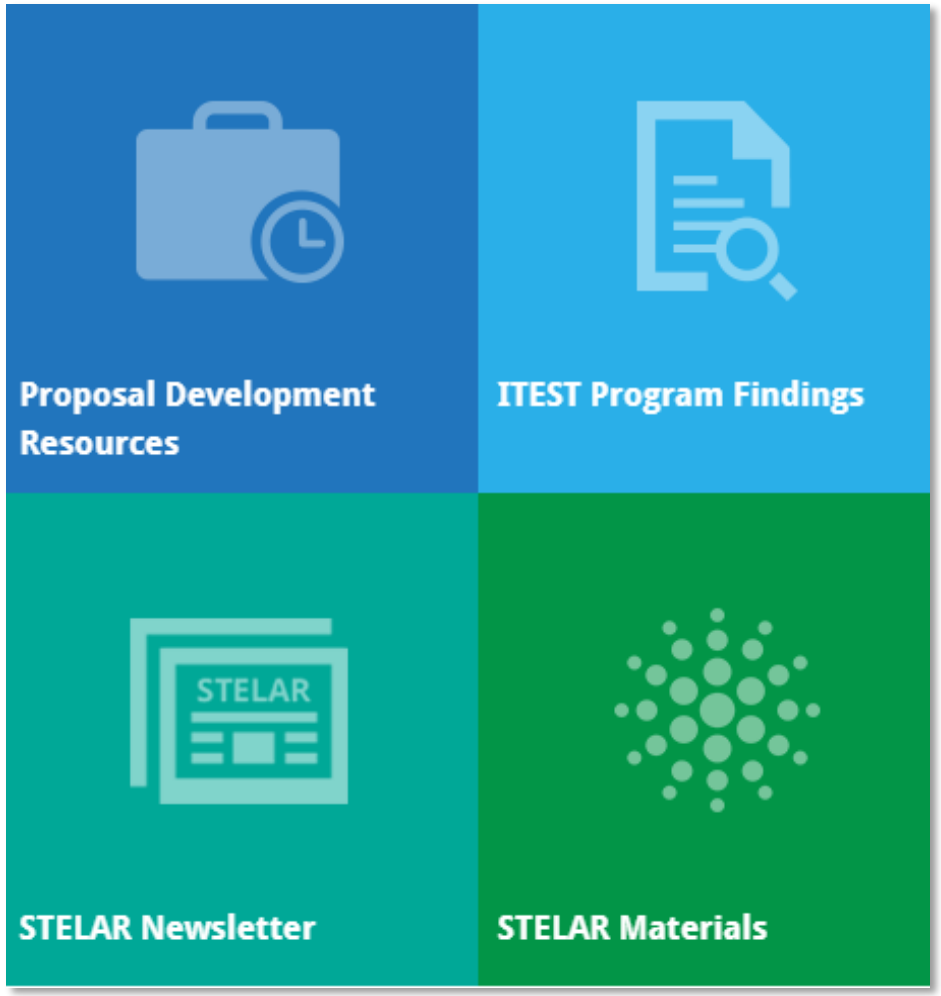
- This webinar is being recorded and will be shared post-event
- Participants will be muted
- Chat is available for conversations
- Type questions into the Q&A pod



STEM Learning & Research Center (STELAR)

- NSF Resource Center for the **I**nnovative **T**echnology **E**xperiences for **S**tudents and **T**eachers (ITEST) Program
- Education Development Center (EDC) has supported the ITEST program since 2003
- STELAR assists both ITEST grantees and those interested in submitting a proposal

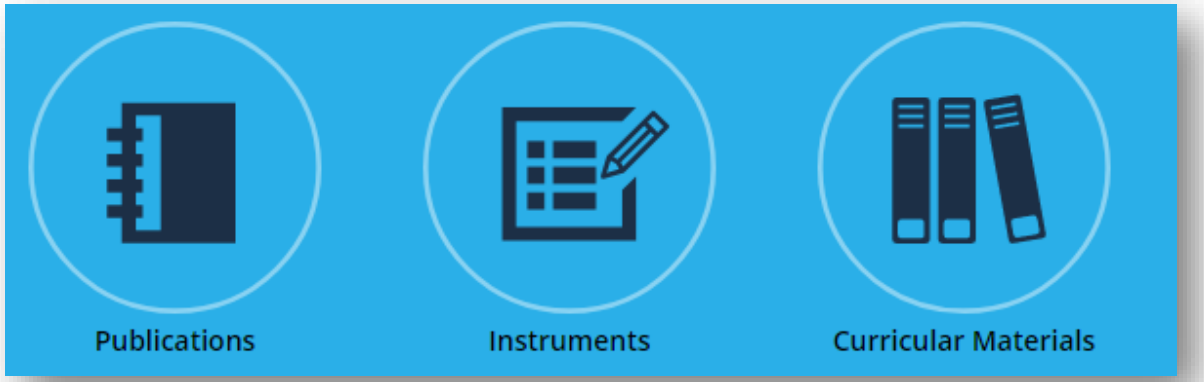
What STELAR does:



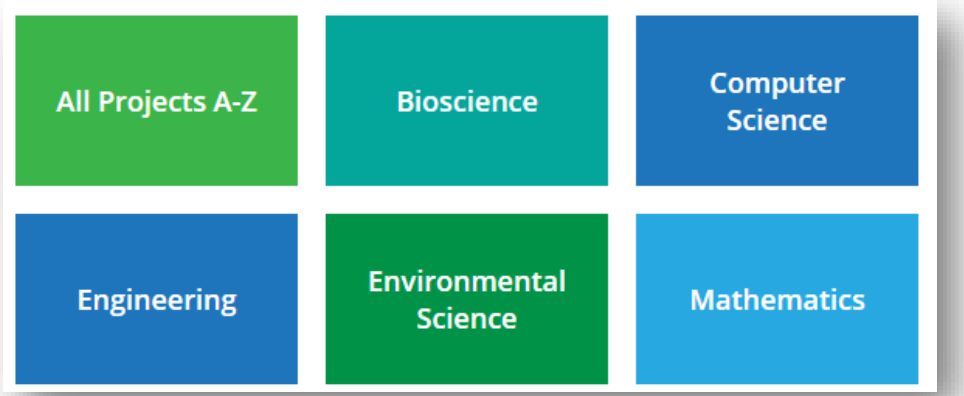
- Facilitate projects' success through technical support
- Inform and influence the field by disseminating ITEST project findings through project syntheses
- Deepen the impact and reach of the program by broadening participation in the ITEST portfolio

STELAR Website:

Resource Library



ITEST Project Profiles



Proposal Development

STEM Learning and Research Center (STELAR)

National Science Foundation

Innovative Technology Experiences for Students and Teachers (ITEST) Program

ITEST-funded research and development projects

STELAR synthesizes and disseminates findings to the STEM education field

K-8 STEM CAREER COMPETENCIES: DEVELOPING FOUNDATIONAL SKILLS FOR THE FUTURE OF WORK

Presenters: Joyce Malyn-Smith, Jessica Juliuson, Sarah MacGillivray, & Clara McCurdy-Kirlis

For more information contact: Joyce Malyn-Smith, Distinguished Scholar at jmalynsmith@edc.org

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Joyce Malyn-Smith

Jessica Juliuson

Clara McCurdy-Kirlis

Sarah MacGillivray

EDC Education Development Center

Today's Presenters

Today's Presentation

- Our motivation for this framework
- An overview of the competencies and format
- What this means for you
- Q&A

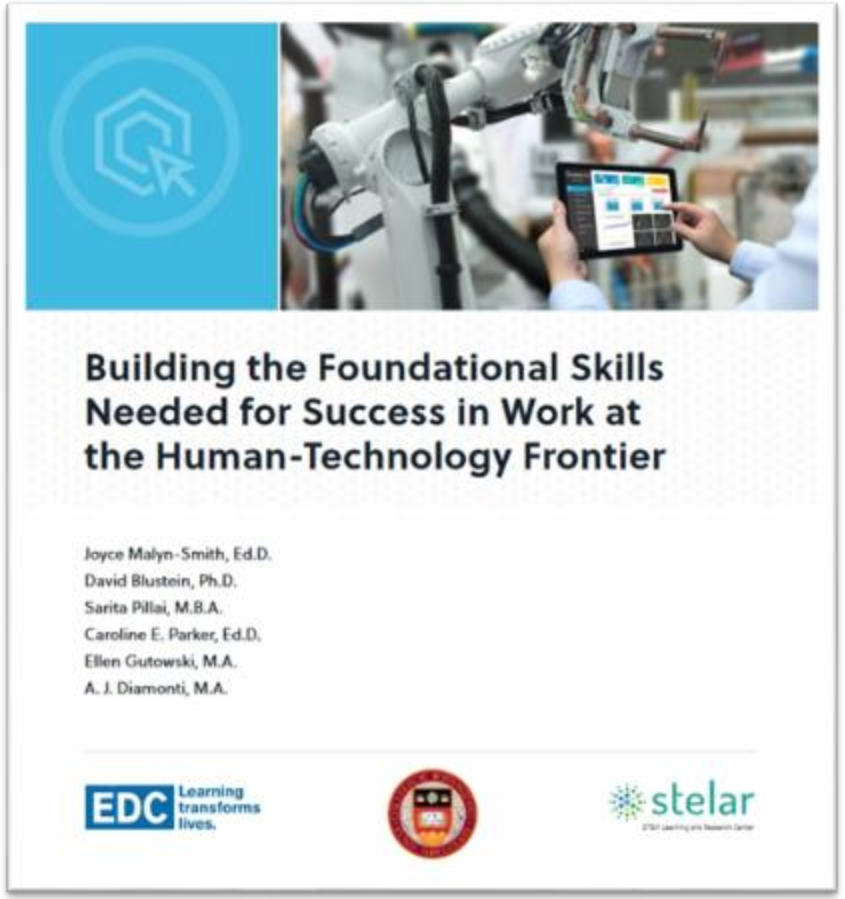
Motivation Behind this Framework

Introduction

- World of work is changing
  - Employment in engineering occupations is projected to grow 3 percent from 2019 to 2029 (about 74,800 new jobs)
  - Employment in computer and information technology occupations is projected to grow 11 percent from 2019 to 2029 (about 531,200 new jobs)
  - NSF's Human Technology Frontier

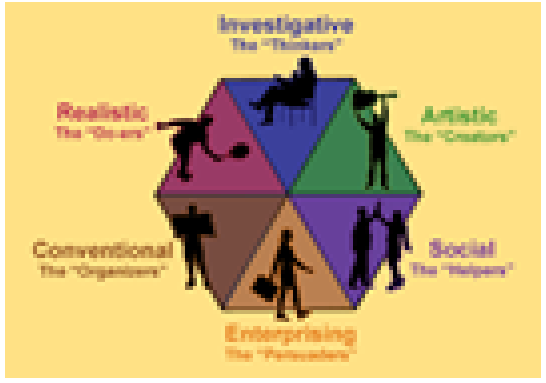
Foundational Skills Needed for Success in Future Work

1. Predominance of Dynamic, Interdisciplinary Teams
2. Focus on Data
3. Artificial Intelligence
4. Ubiquitous Computational Thinking
5. Engineering Design/Design Thinking
6. Convergence/Focus on Life Sciences
7. Cybersecurity
8. Blurred Boundaries between Humans and Machines
9. Lifelong and Flexible Learning
10. Ethics at the Human Technology Frontier



Lessons Learned in Career and Workforce Education

Career Development



Your personality type matched with a compatible work environment will lead to success and satisfaction.

Developmental in nature:

- K-6 Awareness
- 7-8 Exploration***
- 9-12+ Preparation

Begins in the home, nurtured in school, translated into productive and rewarding work. Career Development can be guided.

Begin in K-12 – especially for students with limited STEM role models
Guide development of STEM interests
Develop foundational STEM knowledge/skills,
Connect with STEM workers
Develop self efficacy as a STEM technical/professional. "I can do it!!"

Employ strategies:

- *Career Education Standards*
- *Use technical terminology*
- *Provide role models/first hand experiences such as:*
  - *Guest Speakers*
  - *Field Trips*
  - *Shadowships*
  - *Internships*
  - *Work-based learning*
  - *Apprenticeships*

Why this Framework?

- *K-8 STEM Career Competencies Framework:* Designed to support teachers in integrating opportunities for students into curricula
  - Skill awareness
  - Knowledge development
  - Required attributes
- Question answered in this framework: *What can we do in K-8 to help students develop awareness, explore and start to prepare for careers in this changing world of work?*

Contributions from the ITEST Community

- Chadia Affane Aji, Tuskegee University
- Kristen Bjork, Education Development Center, Inc. (EDC)
- Winnie Black, Central Susquehanna Intermediate Unit, Center for Schools and Communities
- Jie Chao, The Concord Consortium
- Robert Coulter, Missouri Botanical Garden
- Catherine Cramer, New York Hall of Science
- Emily Fagan, EDC
- Anne Gold, University of Colorado at Boulder
- Paul Goldenberg, EDC
- Gerald Knezek, University of North Texas
- David Touretzky, Carnegie Mellon University
- Irene Lee, Massachusetts Institute of Technology
- Josephine Louie, EDC
- Wendy Martin, EDC
- John Mativo, University of Georgia
- Nancy Peter, Philadelphia Education Fund
- Wendy Rivenburgh, EDC
- Lori Rubino-Hare, Northern Arizona University
- Kimberlee Swisher, Arizona State University

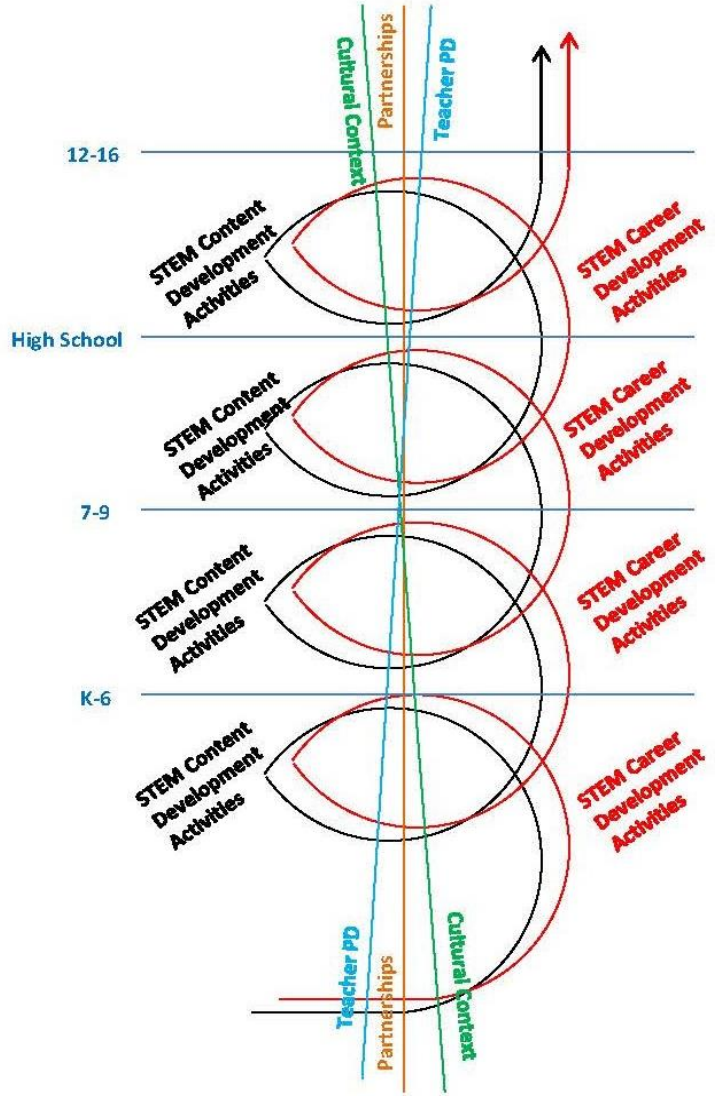
Sneak Peek:
A Look Inside the
K-8 STEM Career Competencies Framework

ITEST STEM Workforce Education Helix

Definition of competency:

"Core transferable skills that allow students to demonstrate career-readiness and make successful school-to-work transitions."

- Adapted from National Career Development Association (NCDA)and National Association of Colleges and Employers NACE)



What is in this Framework?

1. Artificial Intelligence Literacy
2. Computational Thinking
3. Digital and Media Literacy
4. Cybersecurity & Digital Citizenship
5. Data Literacy
6. Dynamic Interdisciplinary teaming
7. Design Thinking
8. Systems Thinking
9. STEM Career Development
10. Lifelong and Flexible Learning

Overview of Each Competency: Lifelong & Flexible Learning Competency Example

Lifelong learning refers to the ongoing acquisition of knowledge, skills, and understandings "from the cradle to the grave" (International Commission on Education for the Twenty-First Century, 1996).

Lifelong learning is the development of human potential through a continuously supportive process which stimulates and empowers individuals to acquire all the knowledge, values, skills and understanding that they will require through their lifetimes and to apply them with confidence, creativity and enjoyment in all roles, circumstances, and environments. (Longworth & Davies, 1996, p. 22)

Future STEM Workplace Rationale

We are already experiencing a shift in expectations for learning at work. While informal learning in the workplace is recognized and highly valued, ongoing formal learning on their own time is increasingly expected of employees. And as humans and machines become more interdependent, the need for lifelong and flexible learning will only increase (Friedman, 2015). Organizations will be pressured to stay at the forefront of change—not just to gain a competitive edge, but to survive. Increasingly, learning will be the responsibility of employees, who must identify and pursue new knowledge to be learned and skills to be developed. New

Overview of Each Competency: Lifelong & Flexible Learning Competency Example (Continued)

Grade-Appropriate Lifelong and Flexible Learning Skills		
K-2	3-5	6-8
Students: • Recognize that learning takes place in a variety of environments • Ask questions about their world and things that provoke their curiosity, both in and outside of school • Experience learning environments characterized by joy and inclusion • Understand how their actions affect situations and other people • Are encouraged to be creative and try new things • Understand that daily life presents opportunities to learn	Students: • Grasp that learning can occur in both formal and informal environments • Seek learning opportunities outside of school • Develop a positive attitude toward learning • Understand how the learning process relates to various careers • Identify habits of mind that support lifelong learning • Begin to familiarize themselves with and adopt professional qualities, such as self-management, agency, self-efficacy, initiative, and enterprise	Students: • Describe how people in various work roles engage in ongoing learning in order to upgrade their skills and adapt to change • Execute projects that demand critical and creative thinking, planning, problem-solving, research, and investigation skills • Apply multiple literacies (e.g., data, information, historical) to identify and understand problems, ask appropriate questions, and design an appropriate solution

Overview of Each Competency: Lifelong & Flexible Learning Competency Example (Continued)

Background Reading and Reference

- The State Library of Queensland, *The Lifelong Learning Framework: Children and Young People* (2011) (http://ck.slq.qld.gov.au)
- Lisa Gueldenzoph Snyder and Mark J. Snyder, Teaching Critical Thinking & Problem-Solving Skills (2008, *The Delta Pi Epsilon Journal*) (http://reforma.fen.uchile.cl/Papers/Teaching%20Critical%20Thinking%20Skills%20and%20problem%20solving%20skills%20-%20Gueldenzoph,%20Snyder.pdf)
- Jacques Delors, *Learning: The treasure within. Report to UNESCO of the International Commission on Education for the Twenty First Century* (1998) (https://www.eccnetwork.net/sites/default/files/media/file/109590engo.pdf)

Classroom and Curriculum Resources

Exemplar ITEST publications and projects:

- Personal Learning Journeys: Reflective Portfolios as "Objects-to-Learn-With" in an Etextiles High School Class (http://stelar.edc.org/publications/personal-learning-journeys-reflective-portfolios-"objects-learn-"-etextiles-high-school)
- STEM21: Equity in Teaching and Learning to Meet Global Challenges of Standards, Engagement and Transformation (http://stelar.edc.org/publications/stem21-equity-teaching-and-learning-meet-global-challenges-standards-engagement-and)

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10. Lifelong and Flexible Learning

Deeper Dive: Cybersecurity & Digital Citizenship STEM Career Competency

STEM Career Competency:
Cybersecurity and Digital Citizenship

To demonstrate competency in cybersecurity and digital citizenship, individuals must be able to:

- Ethically and effectively interact with digital systems and technologies
- Model appropriate and responsible behavior with regard to the use of technology

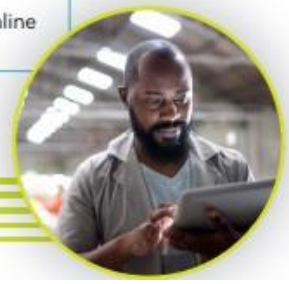
Competency in this area entails protecting digital networks, devices, and data from digital attacks; keeping information confidential; maintaining its integrity; ensuring its availability to those authorized to view or use it; and practicing safe and ethical technology use in the workplace and when engaging with the community.

Future STEM Workplace Rationale

As we move into an era when technology systems are continuously under threat and when home and workplace environments are increasingly interconnected, a solid understanding of cybersecurity and ethical digital citizenship is needed. Employees must know how to keep their data secure, appropriately navigate and contribute in an online environment, and assess and navigate both secure and insecure technology environments in the workplace and at home. They must be able to make sound judgments and to work with their employers to continually assess their levels of risk, adapt to changing needs in an unsecure environment, and determine how to respond when a digital environment cannot be trusted.

Deeper Dive: Cybersecurity & Digital Citizenship (Continued)

Grade-Appropriate Cybersecurity and Digital Citizenship Skills		
K-2	**3-5**	**6-8**
Safety and Security Students: • Identify and compare reasons that an individual should keep information private or make information public • Identify basic steps to keep an account secure, such as passwords to protect information and identity • Know strategies to report dangerous or unsafe online behaviors (such as telling a teacher) • Identify unusual activity by applications and devices that should be reported to a responsible adult • Encode and decode simple messages *Critical Information Processing* Students: • Search for and access information in online environments • Locate sources of information in online environments and identify basic factors that affect credibility, such as source and authorship	*Architecture of Networks and the Internet* Students: • Define what the Internet is and describe how information is sent and received • Learn the components of websites and how they are created and customized *Safety and Security* Students: • Identify why someone might choose to share an account, app access, or devices • Recognize threats to online privacy and identify strategies to address them, such as notifying an adult or not clicking on suspicious links • Understand that there is a difference between private and public Internet networks, and apply strategies to mitigate risks (e.g., virtual private networks, strong passwords) • Identify ways that cybersecurity can be compromised (e.g., downloading files from the Internet, clicking on links in emails) and how to avoid them	*Architecture of Networks and the Internet* Students: • Model the architecture of the Internet and how information flows through it, using specific routes and structures • Describe key features of the architecture of the Internet that contribute to its overall stability, such as breaking information into smaller packets and routing information through multiple nodes *Safety and Security* Students: • Understand how encryption and decryption protect information • Use simple encryption and decryption to share information with peers • Recognize current threats to data security, and interventions to reduce those threats • Understand, access, and use online data security tools • Behave safely and responsibly in online communities



Deeper Dive: Cybersecurity & Digital Citizenship (Continued)

Background Reading and Reference

- MA Digital Literacy and Computer Science Framework (2016) (https://www.doe.mass.edu/stem/standards.html)
- Cybersecurity Career Pathway, *Cyberseek* (https://www.cyberseek.org/pathway.html)
- National Initiative for Cybersecurity Education (https://www.nist.gov/itl/applied-cybersecurity/nice/about)
- International Society for Technology in Education, ISTE Standards for Students (https://www.iste.org/standards/for-students)
- National Integrated Cyber Education Research Center (https://nicerc.org/2020/03/nicerc-home/)
- National Cyber Security Centre, United Kingdom (https://www.ncsc.gov.uk/section/education-skills/11-19-year-olds)

Classroom and Curriculum Resources

- SAE International, *Cybersecurity: Keeping Our Networks Secure* (middle school unit of A World in Motion program) (https://www.sae.org/learn/education/curriculum/keeping-our-networks-secure) ($)
- Cyber A.C.E.S. Program, Activities in Cybersecurity Education for Students, Palo Alto Networks (https://start.paloaltonetworks.com/cyber-aces.html)
- NOVA Labs (https://www.pbs.org/wgbh/nova/labs/)
- Common Sense Education, Digital Citizenship Lesson Plans (https://www.commonsense.org/education/digital-citizenship/curriculum)
- Common Sense Education, Quick Digital Citizenship Activities for K–5 Distance Learning (https://www.commonsense.org/education/articles/quick-digital-citizenship-activities-for-k-5-distance-learning)
- Google, Be Internet Awesome (https://beinternetawesome.withgoogle.com/en_us)
- National Center for Missing and Exploited Children, Netsmartz (https://www.missingkids.org/NetSmartz)

Exemplar ITEST publications and projects:

- Cultivating Elementary Students' Interest in Cryptography and Cybersecurity Education and Careers (http://stelar.edc.org/projects/22567/profile/cultivating-elementary-students-interest-cryptography-and-cybersecurity)
- Developing Digital Makers in the Coding Makerspace to Include Boys of Color in Computer Science Learning and Cybersecurity Workforce Development (http://stelar.edc.org/projects/21274/profile/developing-digital-makers-coding-makerspace-include-boys-color-computer)
- SEEK18 Cybersecurity Module Teacher Guide (http://stelar.edc.org/projects/22536/curricula/seek18-cybersecurity-module-teacher-guide)
- How to Teach Internet Safety to Younger Elementary Students (https://www.edutopia.org/blog/internet-safety-younger-elementary-mary-beth-hertz)

What Does this Framework Mean for You?

Policymakers, Education Leaders, and Researchers

- Understand the characteristics of future work
- Support priorities for career development in K-8
- Identify and seek funding for new research, policy, and programs

Curriculum Coordinators/District Leaders

- Curriculum alignment and integration
- Resource selection and/or development
- Assessment and transition planning
- Professional learning and coaching

K–8 Classroom Educators

- Curriculum enhancement and classroom activities
- Career connections
- Family and community connections
- Equitable and inclusive participation in STEM

Questions

K–8 STEM Career Competencies: Developing Foundational Skills for the Future of Work

Download the framework now!

Thank you!

If you have questions or comments, please do not hesitate to contact us at:

STELAR@edc.org

Or visit us at:

www.stelar.edc.org

Evaluation

Please take the time to complete a brief evaluation:

https://edc.co1.qualtrics.com/jfe/form/SV_55ujXYDvviQdOe2

Your feedback is appreciated!