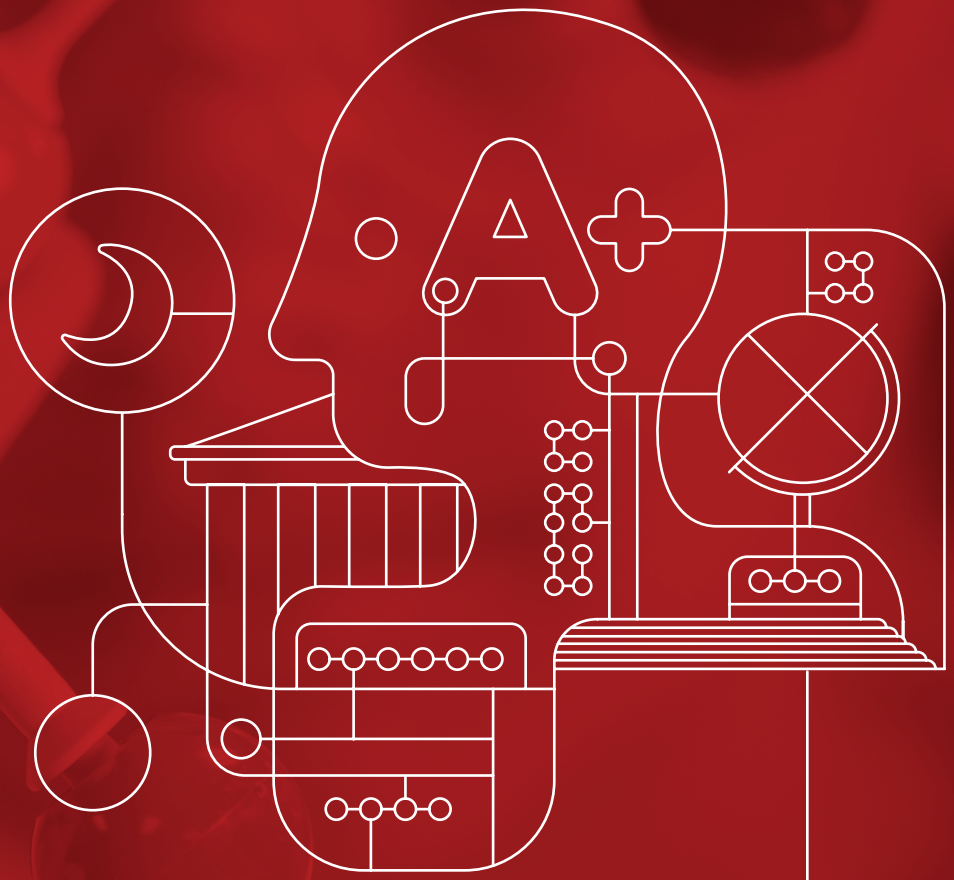
STEM Connections:

THE INTERSECTION OF STEM CONTEXT AND CAREERS



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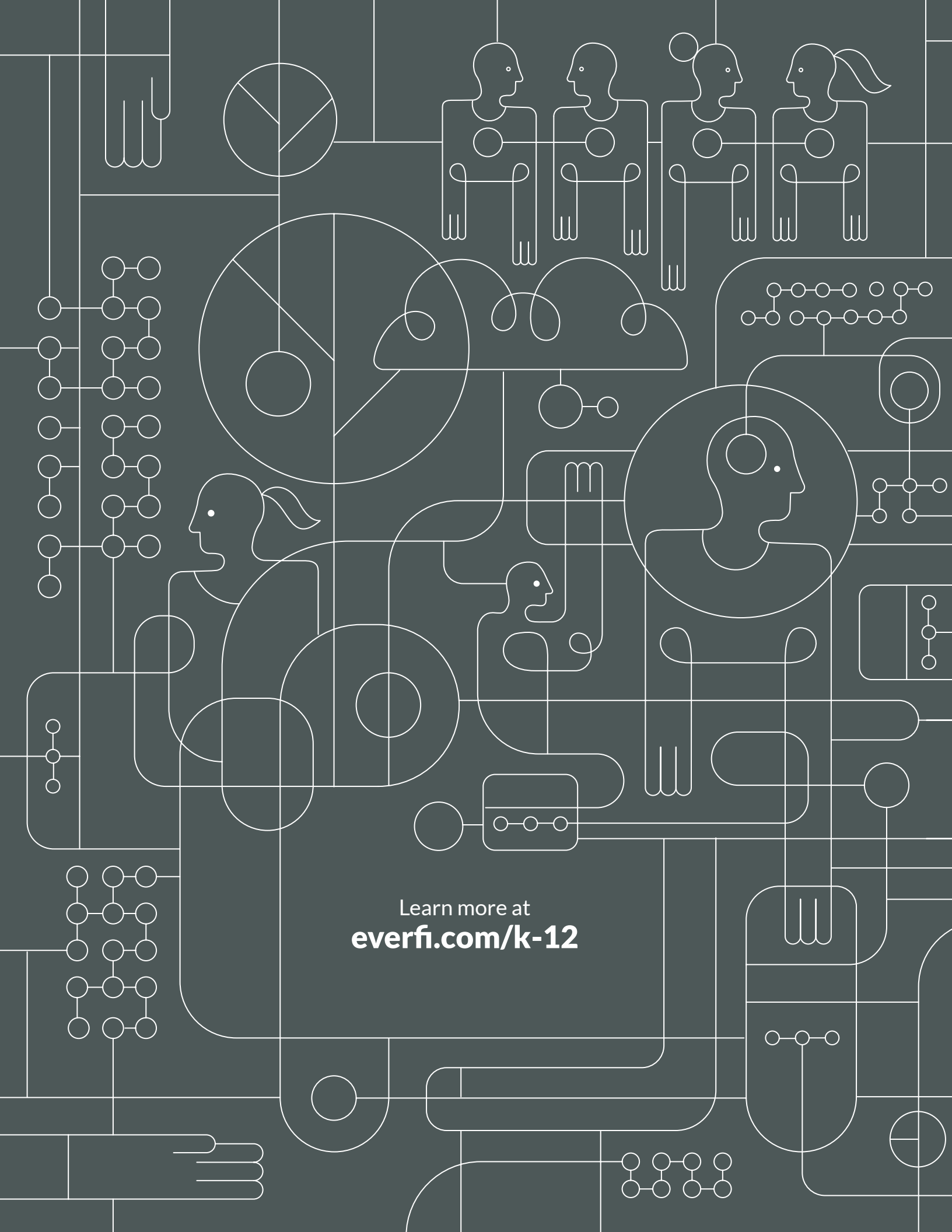
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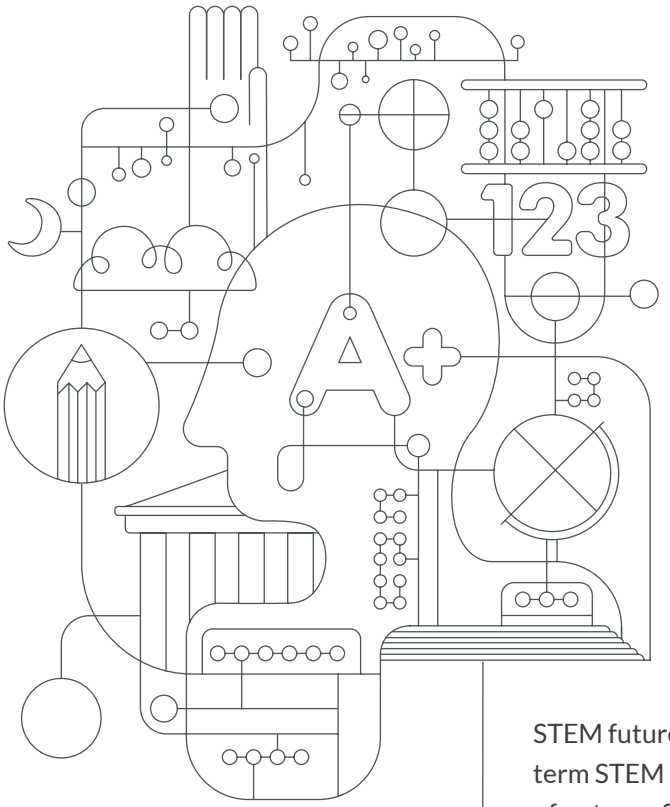


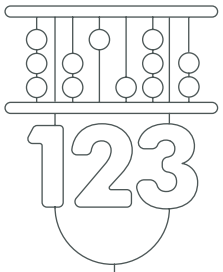
Introduction

Why is STEM so important? During the next five years, major American companies will need to add nearly 1.6 million employees. Of those, 945,000 will need at least basic STEM literacy and 635,000 will need advanced STEM knowledge[1]. Despite the evidence that the core cognitive knowledge, skills, and abilities associated with STEM education are in demand for nearly all occupations[2], many American students conclude early in their academic careers that STEM subjects are boring, too difficult, or unwelcoming. This leaves them ill prepared to meet the challenges that face their generation and our country[3].

One key indicator determining high school graduates' pursuit of STEM in higher education is their interest in STEM when they enter high school[4]. A holistic STEM career preparation strategy, implemented early, can help students develop their vision for a STEM future in the middle school years, setting them on a path toward long-term STEM learning. At the heart of an effective strategy is the development of a strong STEM context among all students. By that, we mean promoting an environment where every student feels supported and capable of developing STEM competencies.

Millions of educators work diligently to bring STEM concepts to life to develop 21st century competencies, such as problem solving, critical thinking, and collaboration. Students are required to take math, and to a lesser extent science, classes throughout middle and high school, but the relevancy and opportunity of excelling in these fields seems non-existent for many students. This report uses likert-scale survey responses collected in the 2017/18 school year from over 13,000 students from 45 states and the District of Columbia enrolled in *EVERFI's Endeavor - STEM Career Exploration*™ course to get a better sense of this persistent challenge. Our goal is to better understand how a "STEM context" relates to a student's awareness of STEM in their surrounding world, their perception of whether or not they can be successful in these academic areas and whether or not they plan to pursue a STEM career. Put plainly, do students see STEM opportunities around them and do they perceive the STEM potential within themselves?

1. Business Roundtable / Change the Equation Survey on U.S. Workforce Skills (2014)
2. Carnevale, A., Melton, M., Smith, N. "STEM" Center on Education and the Workforce at Georgetown University (2013)
3. Hossain, Md, and Michael G Robinson. "How to Motivate US Students to Pursue STEM (Science, Technology, Engineering and Mathematics) Careers." Online Submission (2012)
4. Hazari, Zahra, et al. "Factors that affect the physical science career interest of female students: Testing five common hypotheses." Physical Review Special Topics-Physics Education Research 9.2 (2013)



STEM Context

Previous research indicates that unless students are explicitly made aware of STEM careers and encouraged to pursue STEM subjects in school, there is a low likelihood they will pursue STEM opportunities after graduation. This schema refers to a student's "STEM Context." We determined a student's "STEM Context" by creating an index of four statements that helped us measure existing levels of his or her STEM career knowledge and external engagement. The four prompts were:

Science, Technology, Engineering, or Mathematics (STEM) Context Identifiers

1. **My parents/guardians encourage me to excel in Science, Technology, Engineering, or Mathematics.**
2. **My teachers encourage me to excel in Science, Technology, Engineering, or Mathematics.**
3. **I know someone who works in a Science, Technology, Engineering, or Mathematics career.**
4. **My teachers help me understand careers in Science, Technology, Engineering, or Mathematics.**

This schema refers to responses between 1-4 with the index ranging from 4-16. Students who scored a 12 or above on this index were rated as having a strong STEM context. They agreed to each of the items above. Students who scored an 8 or below on this index were rated as having a weak STEM context; they disagreed with each of the items. Students who agreed with some items and disagreed with others were scored between 8-12 and were rated as having a moderate STEM context. Students who answered 'neither agree nor disagree' or 'NA' to ANY of the four questions were not included.

In this survey, 7% of respondents were characterized in the weak STEM context category, 5% in the moderate STEM context category and 28% in the strong STEM context category. So the large differences are not representative of student respondents on the whole, but rather those students who possess either exceptionally strong or weak STEM contexts. ***Our two major takeaways from this grouping were:***

1.) The group of students who have a strong STEM context is four times as large as students with a weak STEM context.

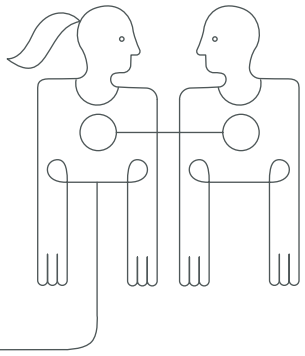
2.) There is still a massive need to support STEM career awareness amongst a majority of middle school students.

Seeing STEM in the world and in themselves

Once students were grouped according to their STEM context level, we explored how students viewed STEM in their surroundings, and whether they could see themselves excelling in STEM as an academic subject and potential career. Student responses to these prompts varied greatly depending on their STEM context.

Students that had a strong STEM context were twice as likely to see real world applications of STEM and the role of imagination and creativity in these fields. Even more striking was the finding that students with a strong STEM context were nearly five times as likely than their weak STEM context peers to think they were the type of person who can have a STEM job. Given the aforementioned growth in STEM career opportunities and importance of middle school students' interest in STEM, the difference in career awareness and self-agency could have long term implications for students in each of these groups.

Percentage of students who agree with these statements by STEM context level	Weak Context	Moderate Context	Strong Context
Science, technology, engineering and math are all around me.	37%	68%	89%
I can do well in science and math if I try hard enough.	43%	76%	91%
Science, technology, engineering and math have real world applications.	37%	67%	90%
Science, technology, engineering and math require imagination and creativity.	31%	57%	78%
I am the type of person who can have a STEM job.	13%	31%	64%



Seeing STEM in their futures

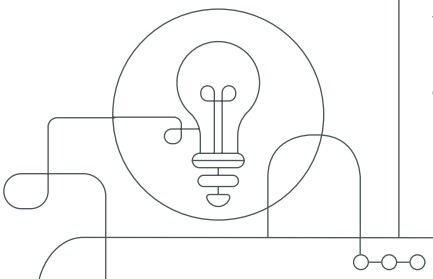
Students with a weaker STEM context are signficantly less aware of careers in these fields. Additionally, students with a weak STEM context are ten times less likely than students with a strong STEM context to know what steps to take to pursue a STEM career. It is not terribly surprising that weak STEM context students possess a limited understanding of a STEM career pathway. However, it doesn't negate the fact that these students are shut out from some of the most promising and fastest growing jobs of the global economy.

Percentage of students who agree with these statements by STEM context level	Weak Context	Moderate Context	Strong Context
I am aware of STEM career options.	16%	39%	75%
There are jobs in STEM that I would like to have.	7%	34%	66%
I will use science, technology, engineering and math when I get out of school.	16%	51%	83%
I know what steps to take to pursue a career in STEM.	6%	24%	61%

Summary and Next Steps

- **Four times as many students were characterized as having a strong STEM Context as opposed to weak.**
- **Students with a strong STEM context are far more likely to be aware of, interested in, and knowledgeable of STEM career pathways.**
- **Students with a weak STEM context represent a very small percentage of students surveyed.**

Developing a stronger STEM context amongst a broader set of young people is within reach. Students will only identify as a potential STEM professional if they see a greater set of careers that appeal to them, believe that they can develop the STEM competencies needed to excel in those jobs, and are coached as to how to get them. Not all students will become "fluent in STEM," but becoming "conversational" can open doors to many exciting, fulfilling, and high-paying professional opportunities.



Questions to Consider:

- **How are students being encouraged to pursue STEM careers at your school?**
- **What types of STEM professionals do your students see? Is there diversity in the types of jobs and fields as well as personal background?**
- **Are parents involved in the STEM career conversations that teachers have with students?**

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