littleBits™

EARLY EXPOSURE TO STEM AND ITS IMPACT ON THE FUTURE OF WORK

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INTRODUCTION

According to the Department of Labor, more than 65 percent of today's students will grow up having careers that do not exist yet. Today, more than ever, it is crucial to prepare our students to become future-ready and to have the confidence to invent the world they want to live in. That's why many schools and districts are now integrating STEM and teaching 21st century skills as part of their programs.

"PROVIDING STUDENTS WITH ACCESS TO CORE STEM COURSES AS EARLY AS ELEMENTARY SCHOOL INCREASES THEIR INTEREST IN PURSUING STEM CAREERS."

One thing that is clear is that STEM (Science, Technology, Engineering, and Math) careers will play a central role in the future of work. According to the U.S. Bureau of Labor Statistics, jobs in STEM currently make up 6.2 percent of all U.S. employment. Additionally, the majority of STEM-related occupations boast wages above the national average and demonstrate above-average growth.

Yet, according to the Programme for International Student Assessment (PISA), a worldwide study that evaluates 15-year-old students' scholastic performance on mathematics, science, and reading, the United States ranks 38th out of 71 countries in math and 24th in science. This indicates that our kids are not adequately prepared to take on the jobs of tomorrow, and this lack of interest and foundational knowledge starts early.

Providing students with access to core STEM courses as early as elementary school increases their interest in pursuing STEM careers, according to a study commissioned by littleBits that was conducted in partnership with YouGov, a third-party research organization.

Astoundingly, the majority of adults currently in the workforce (62 percent) report that they weren't exposed to STEM-related tracks in elementary school. Among the adults that were exposed to STEM tracks in elementary school, the way that STEM was taught in their classrooms varied greatly.

For example, worksheets and textbooks were the most popular method for learning STEM among those that have been in the workforce for 20 years or more. These previous STEM lessons were static and one-dimensional. New workforce entrants, on the other hand, recall learning STEM topics through creative activities, like arts and crafts.

For the United States to truly be competitive in STEM fields, we need to build out a pipeline of kids who are interested in pursuing STEM, as early as elementary school. Not only that, but we need to teach them STEM topics in ways that are accessible to students, such as hands-on and creative learning techniques.

There's a lot to be learned from the ways in which we taught STEM in the past, and the way that educators are encouraging student involvement in STEM today.

EXPOSURE TO STEM IN ELEMENTARY SCHOOL LEADS TO MORE STEM CAREERS

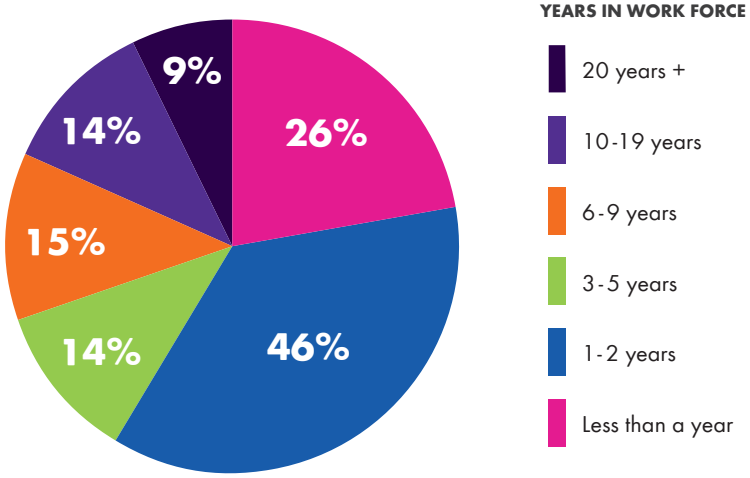
FIRST AND THIRD GRADE CRUCIAL YEARS FOR EXPOSURE TO STEM

Our research has shown that exposing kids to STEM in elementary school – specifically between the first and third grade – provides students with the foundation necessary to fulfill an increased number of STEM-related careers.

According to our research, U.S. adults with 1-2 years of experience in the workforce have reported the highest exposure to STEM concepts in elementary school. Between the ages of 5 and 8, 46 percent of this population experienced a STEM-related track in school. Fifty-three percent of this population is currently working in a job that either entirely or heavily involves STEM – by far the largest percentage of any other group of people in the workforce.

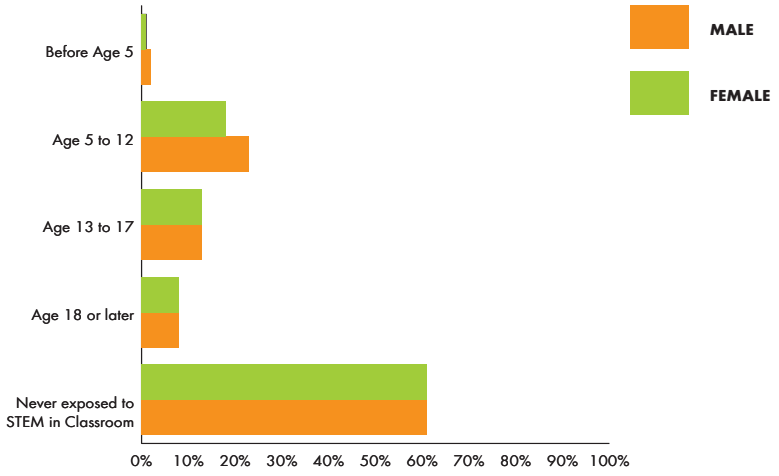
This suggests that exposing students to STEM at a young age goes a long way in capturing their imagination and keeping them interested in science, technology, engineering, and math jobs in the early stages of their career.

FIGURE 1
U.S. ADULTS' EXPOSURE TO STEM CONCEPTS IN CLASSROOM BETWEEN AGE 5-8



However, when we look at these numbers by gender, it becomes clear that girls need to catch up. Overall, girls are five percent less likely to recall learning STEM concepts in elementary and middle school. In fact, only 18 percent of girls learned STEM concepts between ages 5 and 12, while 23 percent of boys learned STEM concepts at the same age.

FIGURE 2
EXPOSURE TO STEM CONCEPTS
BY GENDER AND AGE



A variety of studies over the years have hypothesized that girls lose interest in STEM due to factors such as society, school, family, peers, and individual preferences. To illustrate this point, a comprehensive data overview is found in this UNESCO report.

Microsoft's report, "Closing the STEM Gap," also provided some interesting insights into the lack of girls in STEM classes and careers – including the idea that only 60 percent of girls understand how STEM subjects are relevant for their personal and professional pursuits. Multiple studies show that girls value helping people over making money or working with things, and this is not the case with boys. STEM, therefore, is often considered a more masculine career path.

However, when creativity is injected into the STEM learning process often and early on, STEM tends to become a more sticky subject for girls. According to our findings in conjunction with YouGov, girls are 6 percent more likely to say their teachers used creative activities to teach STEM concepts.

That's why it's so important to embrace the idea of STEAM (Science, Technology, Engineering, Art, and Math). Adding the "art" to STEM enables students to kickstart their creativity and develop creative confidence.

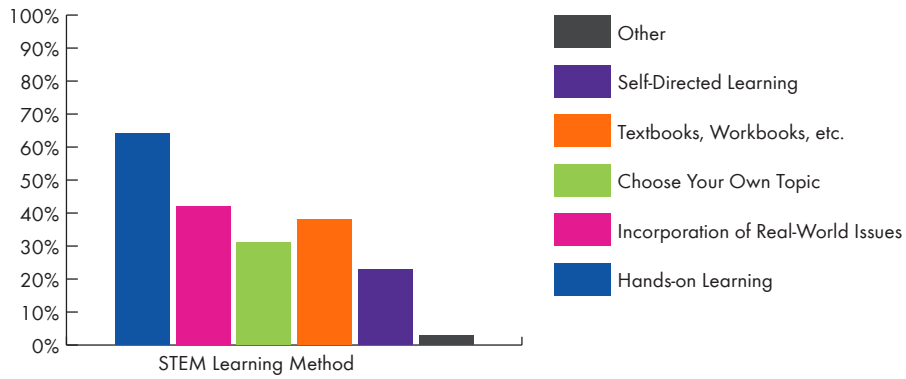
HANDS-ON LEARNING IS THE BEST WAY TO TEACH STEM CONCEPTS

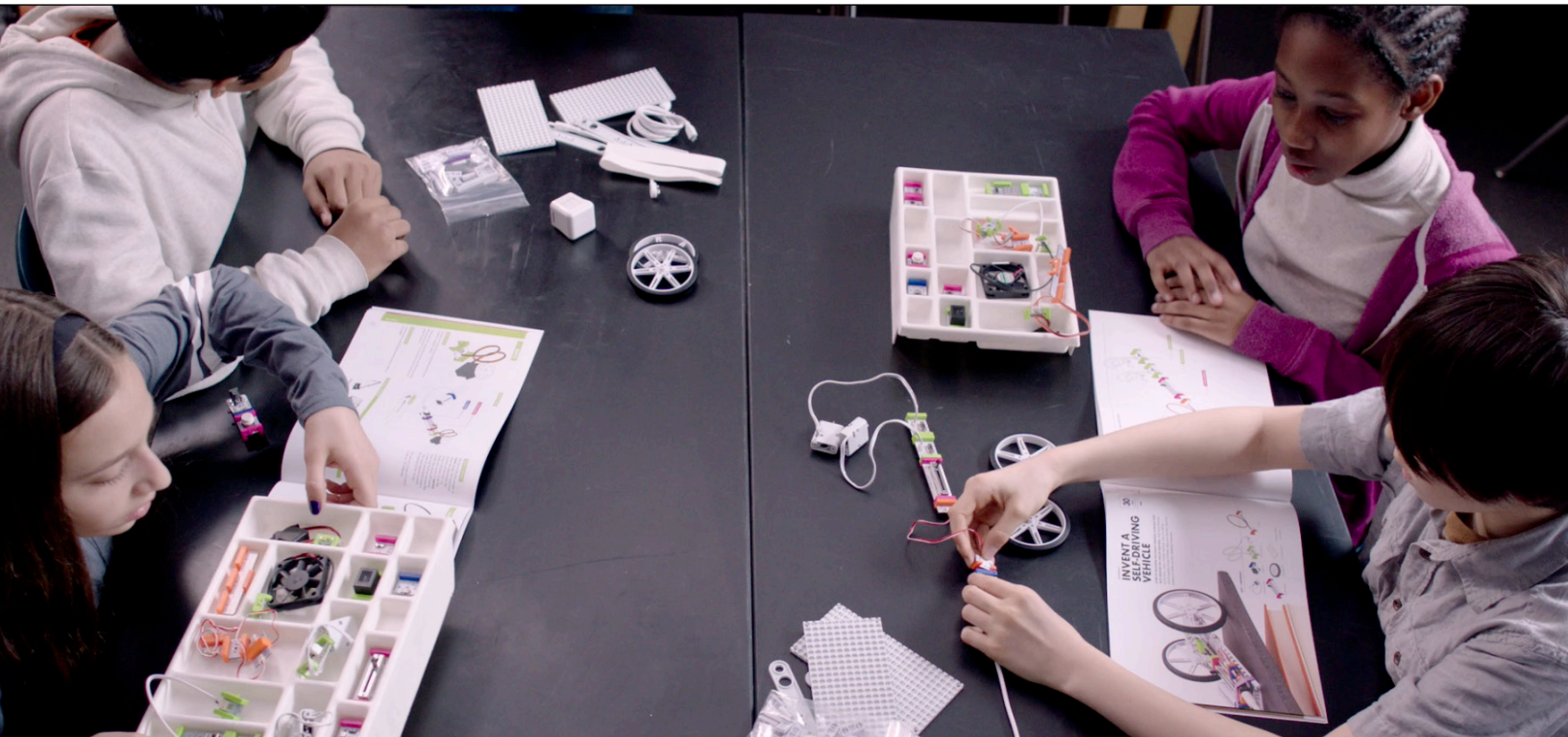
While teachers are still learning the best ways to teach STEM lessons in school, U.S. adults had no trouble pointing to the most effective STEM lessons from their childhood. Hands-on learning ranked highest in terms of effectiveness in teaching STEM concepts, with 64 percent of respondents listing it among the most effective ways of learning STEM.

This ranking was equal between girls and boys, suggesting that – no matter their gender – kids are looking for authentic understanding of STEM topics. They thrive when they are able to dive in, play, remix, and share what they have built.

Incorporation of real-world issues was the second most effective way for students to learn STEM topics. Forty-two percent of respondents listed it among the most effective ways of learning STEM. Again, the ranking was equal between girls and boys – suggesting that differences between genders aren't so overwhelming after all.

FIGURE 3
BEST METHOD TO LEARN STEM TOPICS





So, what does an effective STEM program look like in elementary school? While it's natural to assume it involves expensive tools, in-depth knowledge of STEM topics, and an overhaul of existing curriculum, the truth is that it is less complicated than you might think.

According to the U.S. Department of Education, STEM in elementary school can be categorized by the following characteristics:

HANDS-ON

HANDS-ON EXPLORATION.
One of the most important ways that kids make connections between real-world ideas and STEM concepts is through hands-on exploration. They need to touch, play, explore, and invent in real life, in real-time.

INTEGRATION

INTEGRATION OF TWO OR MORE SUBJECTS.
STEM doesn't have to be a science lesson or a math lesson. It can be a Language Arts class that explores the subject in a new way – through the lens of STEM.

REAL WORLD CONNECTION

CONNECTION TO REAL-WORLD PROBLEMS AND SOLUTIONS.
Did you know that baking a cake is considered a STEM activity? It involves measurement, tools, design skills, chemical reactions, and – if you are ambitious and decide to apply frosting – art!

TECHNOLOGY

USE OF TECHNOLOGY TO FACILITATE LEARNING.
The newest technologies allow us to try things in physical and virtual classrooms that were not possible before. What you use depends fundamentally on what you are trying to accomplish.

HOW TO INCORPORATE STEM INTO YOUR ELEMENTARY CLASSROOM

There's no better time to start than now. Incorporating STEM curriculum into classrooms as young as elementary school has proven results. Following are some tips that will help even the least experienced educators in STEM to get started.

TALK ABOUT IT.

Use words like experiment, design, invent, prototype, etc. Incorporating STEM into kids' thinking is a powerful way to incorporate it into their reality and understanding. Contrary to what we may believe, kids can – and do – understand complex STEM topics.

MODIFY YOUR LESSONS.

Most schools and school districts don't have the budget to invest in large-scale STEM tools right away. That's why you should feel empowered to start small. Incorporate STEM-related books and activities into your everyday class routine. Choose an existing lesson plan and modify it to include a more in-depth question for students to consider.

CHANGE YOUR MINDSET.

Many educators never received STEM instruction in school themselves, nevermind learned how to teach it to their students. However, you may be surprised at how easy it is to dive in. STEM can be a way to enrich your lesson plans. Set aside a half hour per day in any subject to look at the topic through the lens of STEM – weaving science, technology, engineering, or math concepts into particular lessons.

INVOLVE FAMILIES.

Encouraging parents to actively participate in their kids' STEM education is a powerful way to forge strong home-school connections and to extend classroom teachings into the real world.

And remember, using STEM concepts to invent something new is iterative. It involves creating a solution to a problem, playing with the solution to figure out what works and what needs improvement, remixing the solution to incorporate new ideas, and sharing your invention. This invention lifecycle calls for a lot of trial and error.

METHODOLOGY

All figures, unless otherwise stated, are from YouGov Plc. Total sample size was 1183 adults. Fieldwork was undertaken between 8th - 9th August 2018. The survey was carried out online. The figures have been weighted and are representative of all U.S. adults (aged 18+).