Promising Developments in Edtech for Science

July 2016

newschools venture fund

The NewSchools Ignite Team prepared this report to share findings on science education and lessons learned from launching the **Science Learning Challenge**.

newschoolsignite is a six-month virtual accelerator program that catalyzes product growth in market gaps important to teachers and students, and where innovation is lagging.

NewSchools Venture Fund is a national nonprofit venture philanthropy working to reimagine public education. NewSchools has three investment strategies, with Ignite being part of the Tools & Services strategy.

Innovative Schools

Launch or redesign innovative district and charter schools

Tools & Services

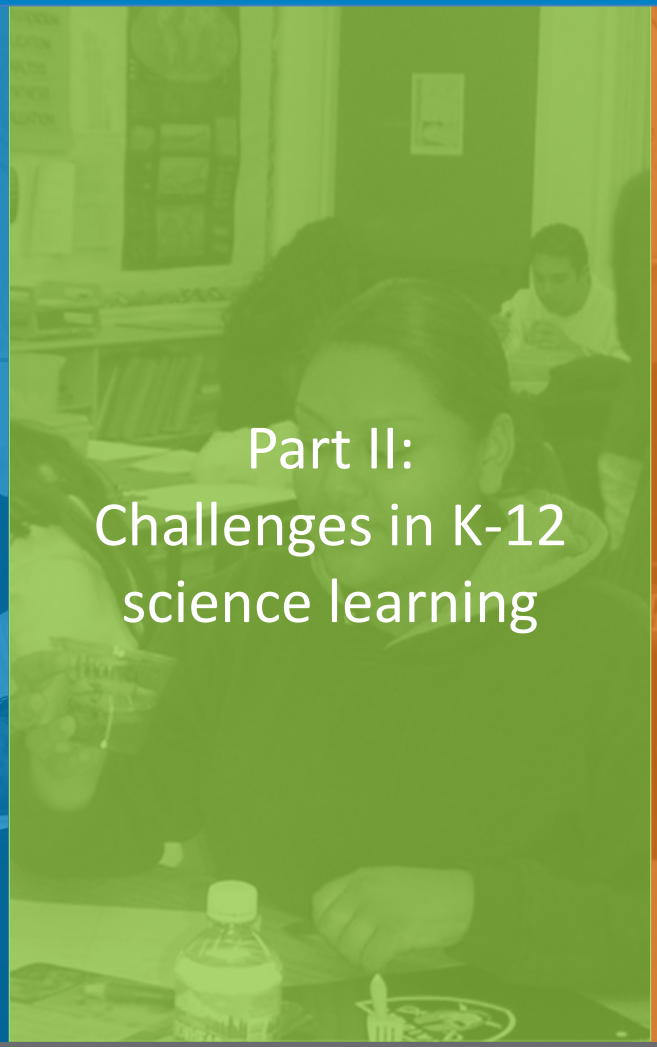
Support for-profit and nonprofits through market gap challenges and direct investments

Diverse Leaders

Increase Black and Latino founders and CEOs, senior leadership, and board members

Overview

Part I:
Why science matters



Part II:
Challenges in K-12 science learning

Part III:
Opportunities for edtech to support science learning

Part I: Why Science Matters

Science is an integral part of everyday life that unlocks future career paths for students

"The whole of science is nothing more than a refinement of everyday thinking."

-Albert Einstein

Science learning can spark endless career possibilities for students and build critical skills

Doctor Physicist Programmer Teacher Newscaster Painter Pharmacist

Banker Pilot Engineer Chemist Musician

Building science-related skills

Attention to detail	Technical skills
Analytical skills	Calculations, measurements

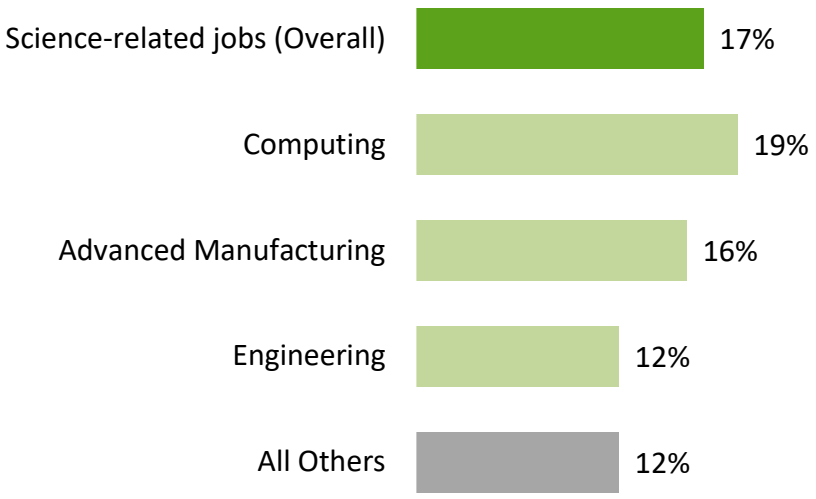
Building behavioral skills that support science learning

Creative abilities	Organization skills
Communication & cooperation skills	Leadership skills

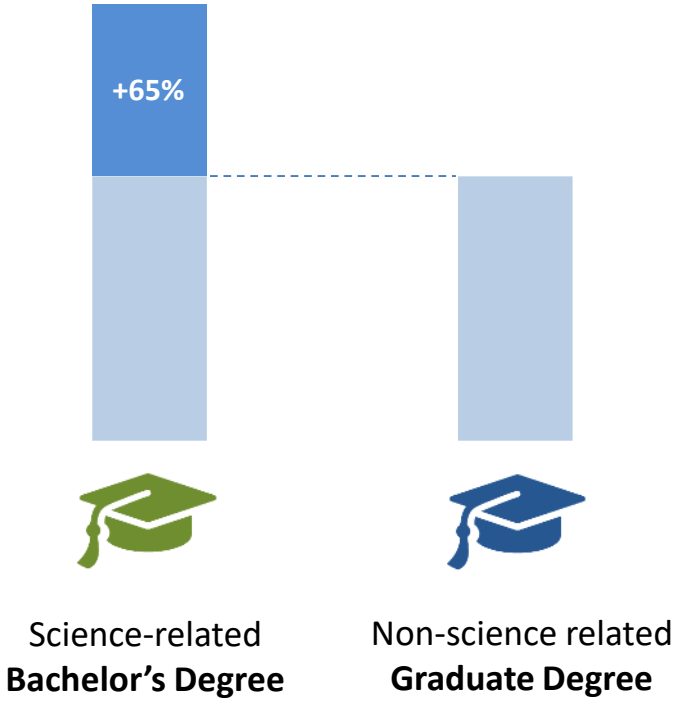
Source: iSeek Careers

Science-related fields have some of the fastest growing jobs, and offer substantial earning potential

U.S. job growth, 2014-2024



Earnings are higher with science degrees



Source: Change the Equation, 2015; Georgetown University Center on Education and the Workforce, 2011

There are more science-related jobs than candidates in the U.S.

For every 10 job posts…

there are only ~5 qualified science-related candidates

5

By 2018, there could be **2.4M unfilled science-related jobs**

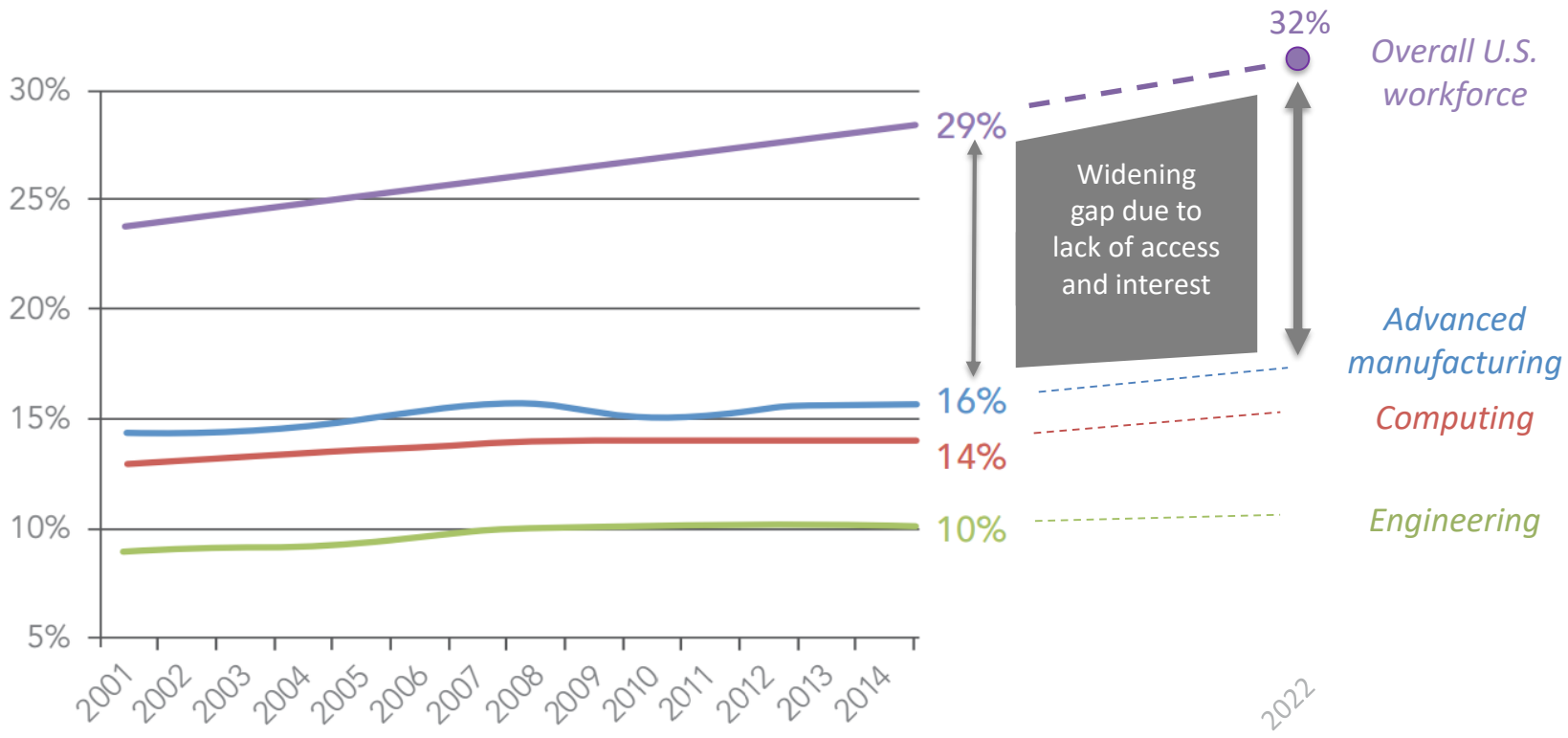
there are 36 overall qualified candidates

36

Source: Change the Equation, 2012; Adecco Consulting Report

Black and Latino workforce is growing, but increasingly underrepresented in science-related jobs

Black and Latino workforce as percentage of jobs



Sample science-related jobs, not comprehensive

Growing emphasis on science education

Many of today's jobs and those in the future require science-related skills. Technology has accelerated this need.

Today's challenges require more complex analyses and science-based solutions. Global competitiveness is fueled by innovation, with science at its core.

Science literacy skills are currently not taught in an engaging way. This requires a shift towards hands-on, inquiry-based experiences from an early age.

Source: Adecco Consulting Report

Key Takeaways

1. Science education is an essential foundation
2. Science-related jobs are in high demand, without enough qualified candidates to fill them
3. While the Black and Latino workforce is growing, they are underrepresented in science-related careers
4. There is a greater focus on science education due to macroeconomic and societal factors

Part II: Challenges in K-12 Science Learning

Students are struggling to gain science mastery, and teachers need better resources to support science learning.

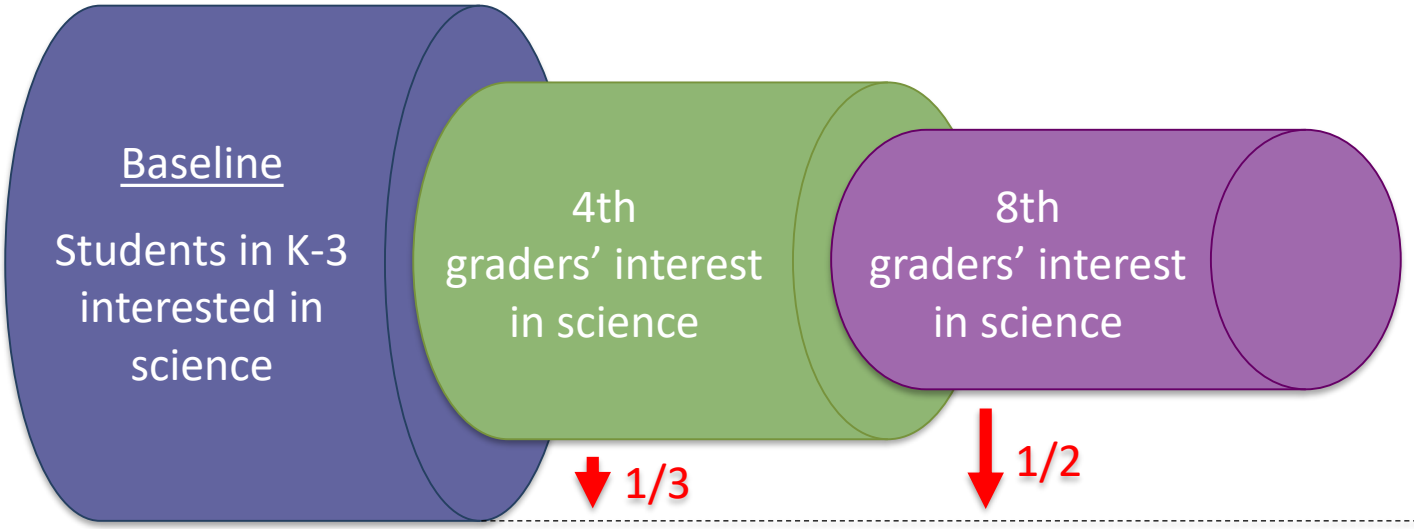
"The science fair projects of today could become the products or businesses of tomorrow."

-President Barack Obama

Studies show student interest in science begins to decline as early as 4th grade

Interest in science over time by students

Elementary

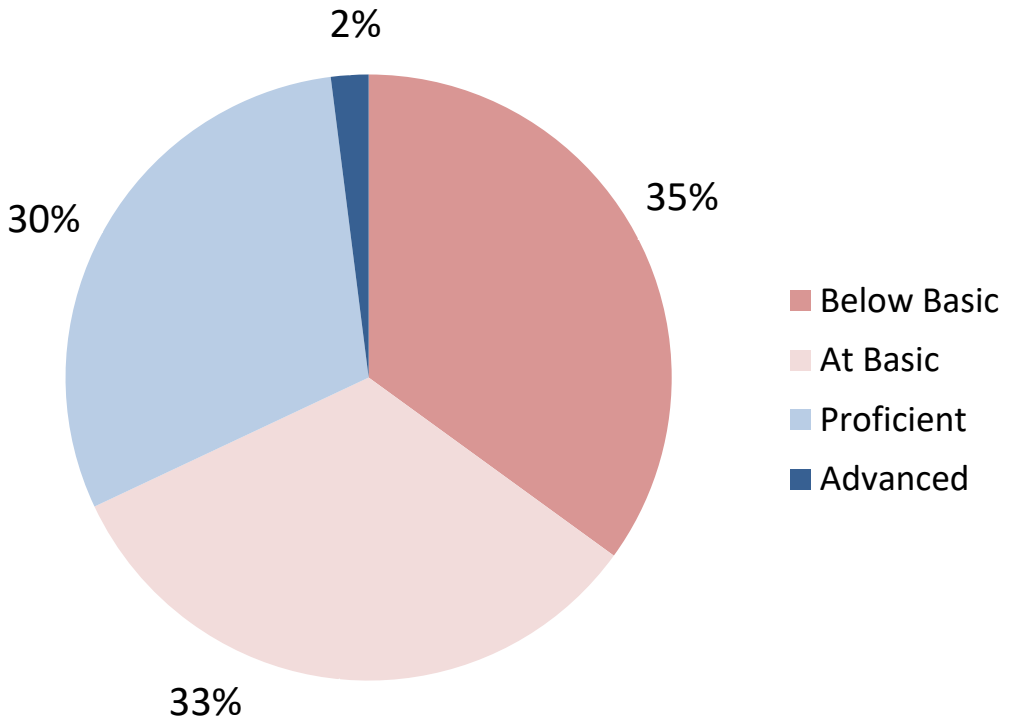


Among students originally interested in science, one-third lose interest by 4th grade and one-half by 8th grade.

Source: National Center for STEM Elementary Education at St. Catherine University, 2011

Science education is failing to teach more than two-thirds of middle school students

NAEP science scores for 8th graders, 2011

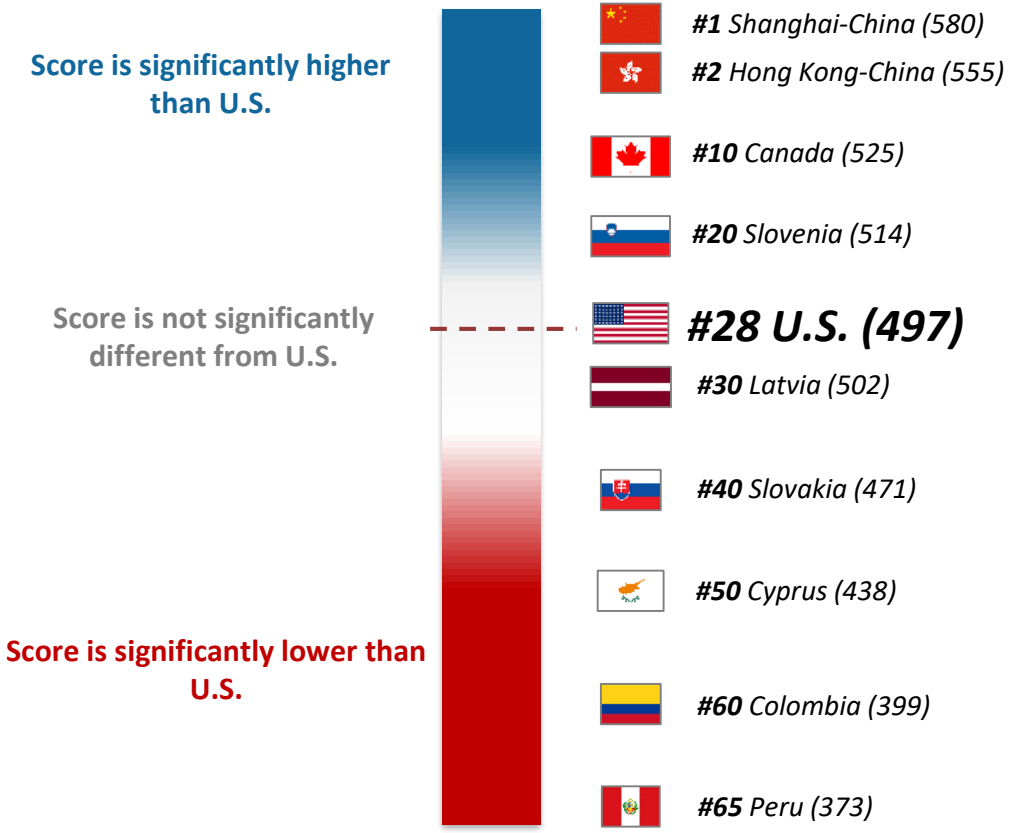


National Assessment of Educational Progress (NAEP) is the largest nationally representative and continuing assessment of what America's students know and can do in various subject areas.

Source: National Assessment of Educational Progress (NAEP), 2011

America's position as the world's innovation hub is being challenged

Global PISA science scores among 15-year-olds in select countries, 2012

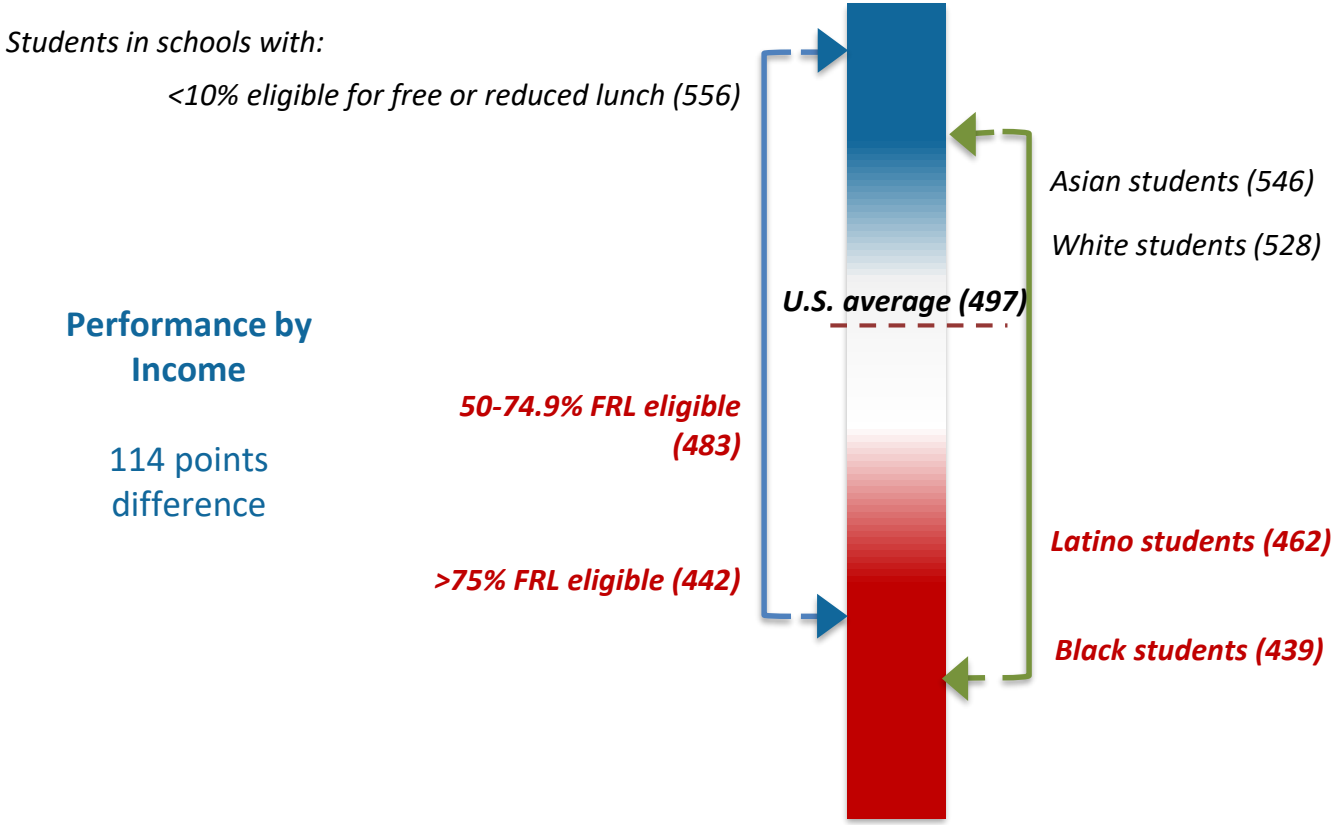


The Programme for International Student Assessment (PISA) is a triennial international study conducted by the OECD to test skill and knowledge of 15-year-old students.

Source: OECD, PISA 2012

Within the U.S., scores are significantly lower among Black, Latino, and lower-income students

PISA science scores within the U.S., 2012



Performance by Income

114 points difference

Performance by Race

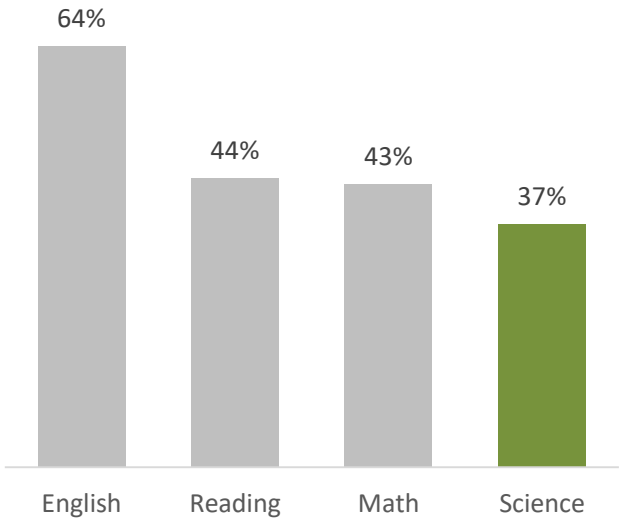
107 points difference

Source: OECD, PISA 2012

Among high school core subjects, college readiness in science remains the lowest

ACT High School Science Scores, 2014

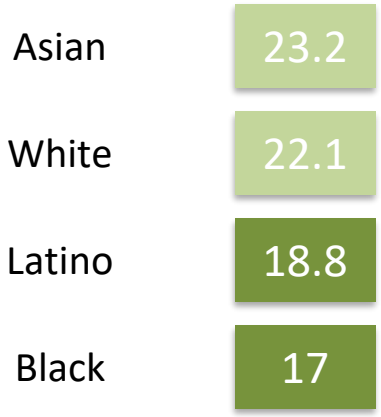
Percentage of students who met college readiness benchmark scores



Benchmark scores by subject	English	Reading	Math	Science
	18	22	22	23

Avg. science scores by race

Score scale: 1-36



Black and Latino students continue to score lower compared to other groups

Source: ACT, 2014

The student pipeline is broken, resulting in fewer science-related professionals

Shortage of Science-related Graduates

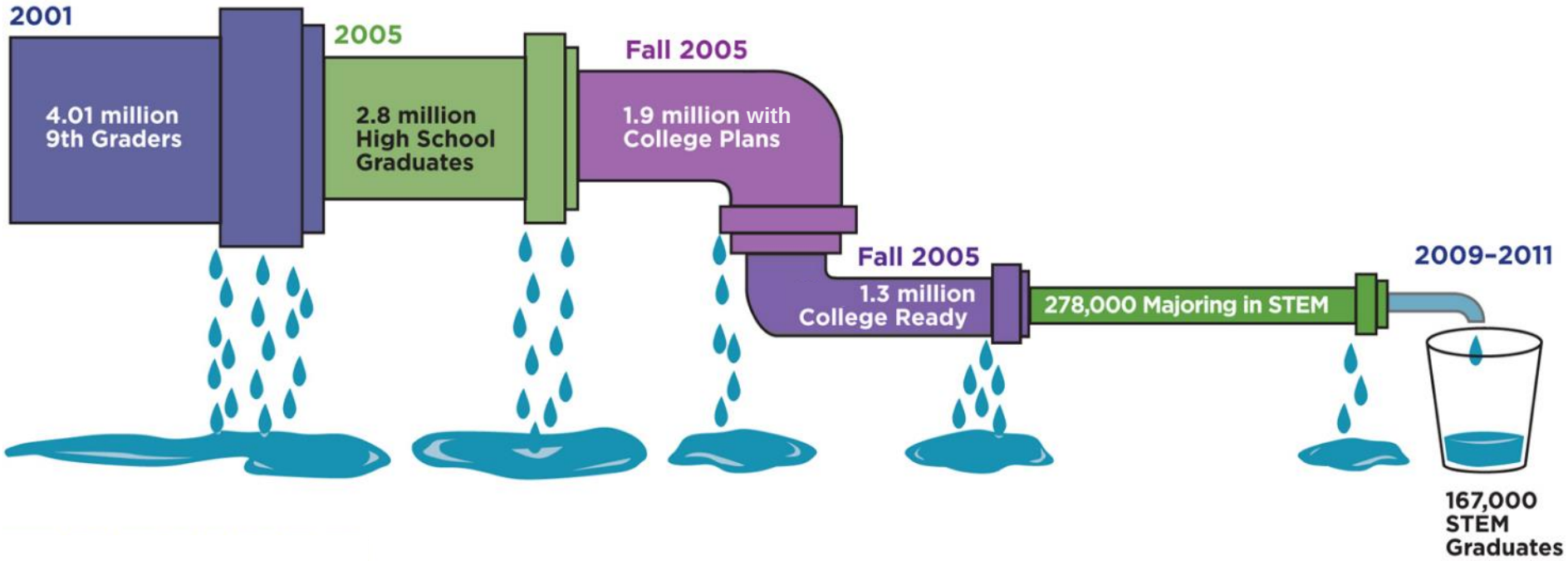
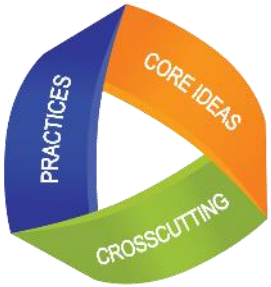


Image source: NCES Digest of Education Statistics Science & Engineering Indicators Report, 2008

Science education standards are being updated to better prepare students



The **Next Generation Science Standards (NGSS)** is a state-led initiative to develop new K-12 science standards rich in content and practice and arranged in a coherent manner across disciplines and grades to provide internationally benchmarked science education.

Every NGSS standard has three dimensions:

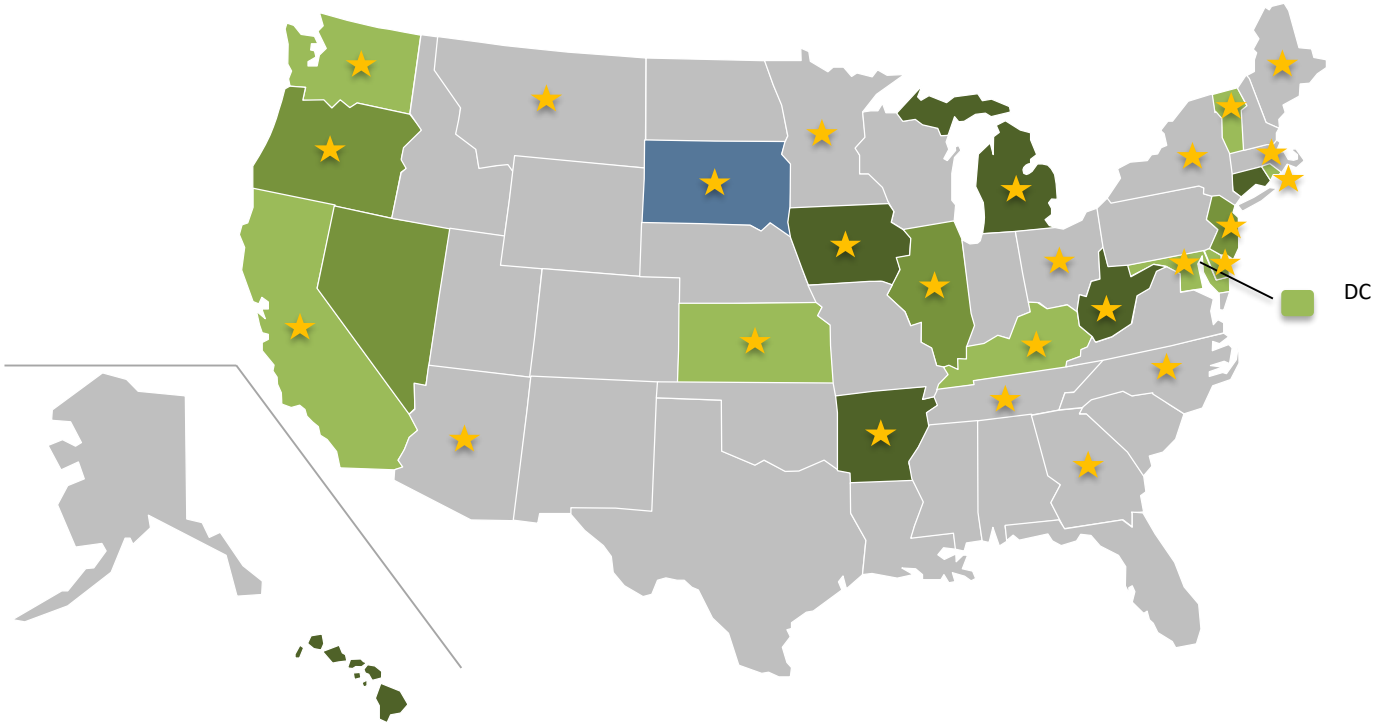
- disciplinary core ideas (deeper understanding of content)
- scientific and engineering practices (application to the real world)
- crosscutting concepts (interconnectedness of science and engineering)

Source: Next Generation Science Standards, Academic Benchmarks

NGSS progress and adoption has spread, leading other states to update science standards

Science education standards reform

- As of early 2016, 26 states have been involved in NGSS and 18 states have adopted them
- South Dakota has adopted similar state science standards



States Adopting NGSS

18 states + DC

2013 **2014** **2015-2016**

Lead State Partners

26 states involved in developing NGSS

Other state(s) adopting similar standards to NGSS

Source: Next Generation Science Standards, Academic Benchmarks, National Center for Science Education, 2015

Key Takeaways

1. Students are struggling to achieve science mastery throughout K-12
2. Students are not prepared to pursue advanced science courses in college
3. Black and Latino students do not yet perform at the same levels as other racial groups
4. There is a growing U.S. movement for more rigorous science standards

Part III: Opportunities for Ed tech to Support Science Learning

Ed tech tools hold the potential to facilitate and improve science learning

"The only area where we don't have really good content is in science."
- Middle school principal

Teachers value digital tools, but struggle to find effective products

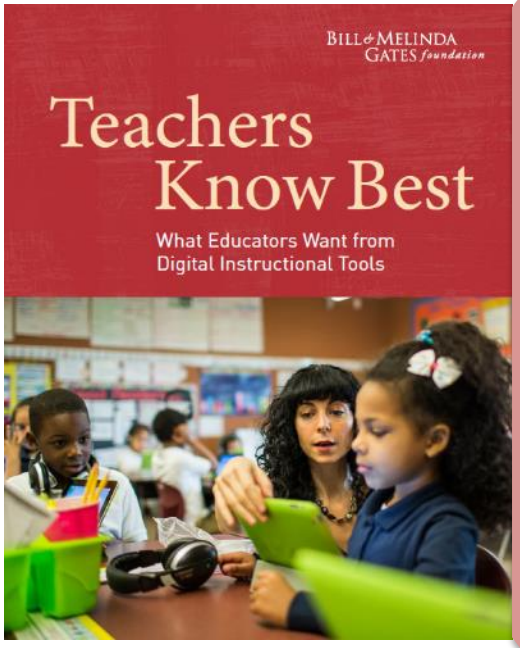
Teachers see **value** of **using technology** for student learning

Teachers **regularly use** some form of **digital tools** to guide instruction

Teachers across all subjects found digital tools to be **effective**

Source: Bill & Melinda Gates Foundation, 2015

A dearth of effective K-12 science tools to teach standards



http://www.teachersknowbest.org/reports

Excerpt from "Teachers Know Best Report":

Four areas with the greatest deficit of instructional resources that are available, sufficient to teach the standards, and in digital form:

- K-5
- Elem. English Lang. Arts
- 6-8
- MS Social Studies
- 9-12
- HS Math
- K-12 Science

Source: Bill & Melinda Gates Foundation, 2014

Teacher needs vary across grade levels

What teachers want from science digital tools

Teachers Know Best 2.0 Report, Bill & Melinda Gates Foundation

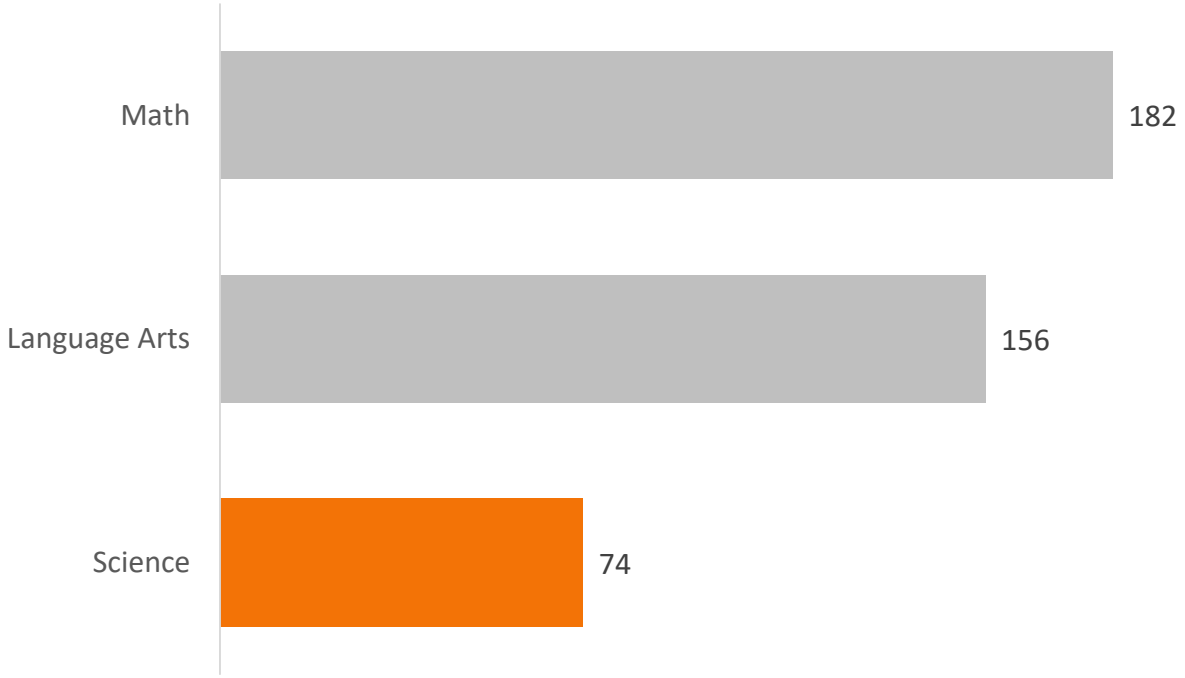
K-2	• Delivery instruction • Vary delivery method
3-5	• Support student collaboration • Foster independent practice
6-8	• Vary delivery method • Diagnose student learning
9-12	• Support student collaboration • Tailor learning experience

Source: Bill & Melinda Gates Foundation, 2015

There are fewer science ed tech options than math and language arts

Ed tech companies by subject areas

Number of companies listed on EdSurge Product Index (as of 2016)



Source: EdSurge Product Index, 2016

NewSchools asked teachers what they use and seek

What technology/devices do students currently have access to at your school?	• Some teachers have 1:1 student-to-device ratio, while others noted device carts and computer labs • Chromebooks and iPads were most popular, followed by other Windows laptops
Which science products do you currently use?	• Simulations and YouTube clips were common use cases • Interactive illustrations and apps were used to explore biological systems • Some had sophisticated tools (e.g. makerspaces, design)
How do you define quality in regards to edtech tools? What academic/social outcomes are you most interested?	• Student feedback and engagement were among the top qualities teachers sought in tools • Collaboration is key (teacher and student, student to student) • Deeper learning and connections to the world

Source: NewSchools Market Research, 2015

What do teachers see as opportunities to improve science learning?

Introduce content via independent exploration

Integrate with other subjects like design and 21st century skills

Enable – not inhibit – social interaction and connection with the physical/natural environment

For K-5:
Integrate with ELA and Math standards and offer professional development as most teachers are generalists

For 6-8:
Provide teachers with support for deeper inquiry and "exploration of true phenomena"

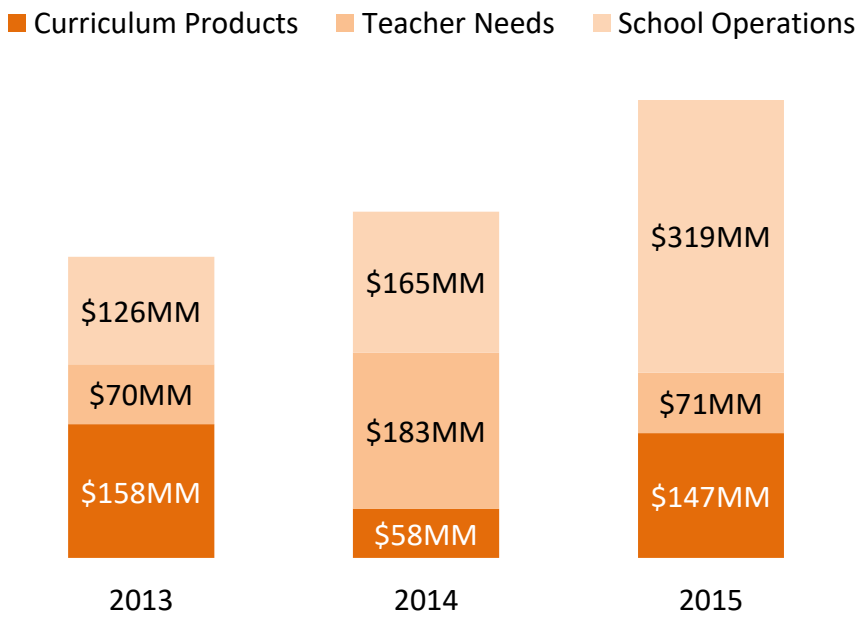
For 9-12:
Develop more hands-on, project-based content and creating connections to college and careers

Source: NewSchools Market Research, 2015

Consistent growth in K-12 edtech venture funding is encouraging

Growth in K-12 edtech investing, 2015

EdSurge



Curriculum Products: Content tools that teach specific subjects and skills

Teacher Needs: Products that help teachers with classroom-related activities such as grading, classroom management and lesson planning

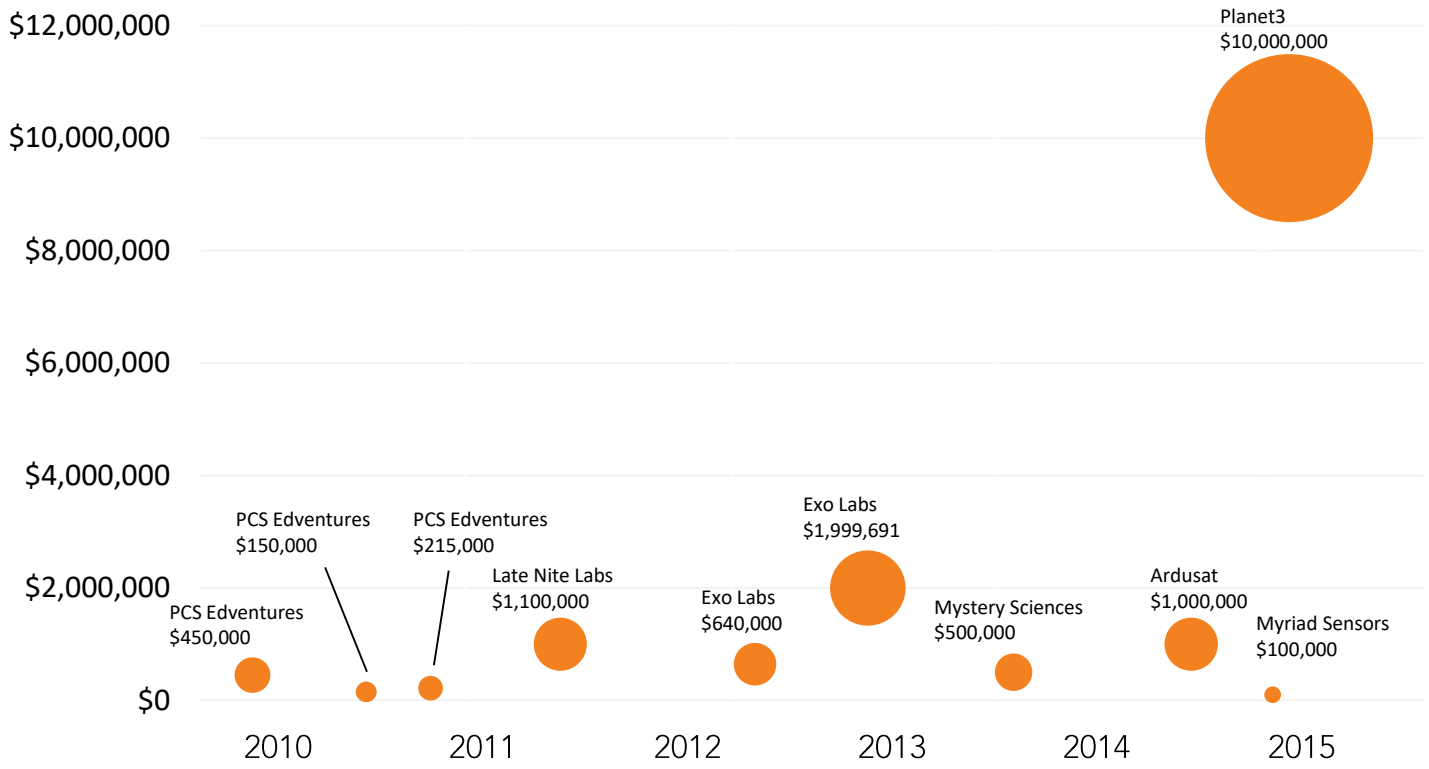
School Operations: Products that are designed to help improve the management of schools, teachers, students and parents, primarily for use by principals and other school administrators

Source: EdSurge, 2015

The size of science ed tech funding deals grew in the past year

Notable Ed tech Funding in Science Education

EdSurge Product Index



Source: EdSurge, 2016

NewSchools Ignite launched the Science Learning Challenge to accelerate science innovation

newschoolsignite

six-month virtual accelerator program

Launched in July 2015, the Science Learning Challenge aimed to:

Empower students and teachers as explorers and creators

Enable new interactions with peers, instructors and the physical world

Leverage connections to other subject areas

Make learning more accessible

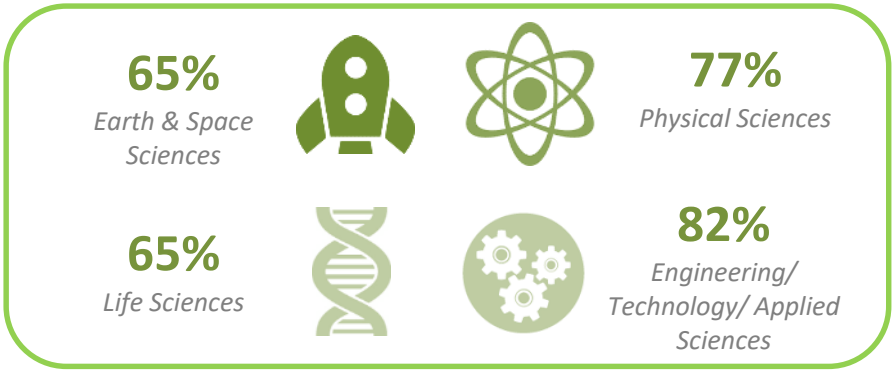
Connect content to life beyond school

Ignite students' curiosity to facilitate deeper learning in science

Science Learning Challenge applicants reflected science ed tech market trends

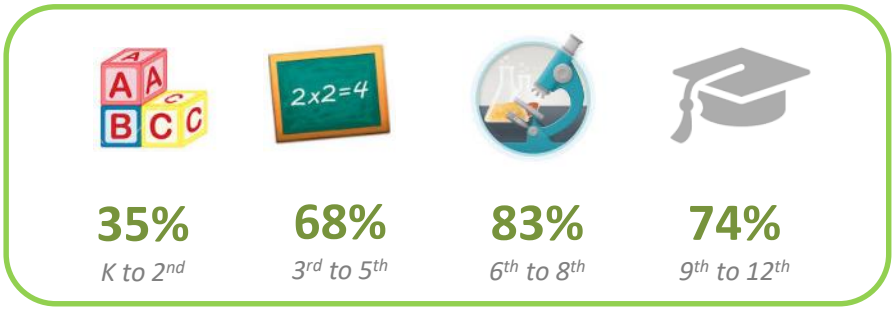
Science Learning Challenge Applicant Pool – 119 companies

Science Subject Areas



The most popular subject area was engineering/technology/applied sciences.

Grades

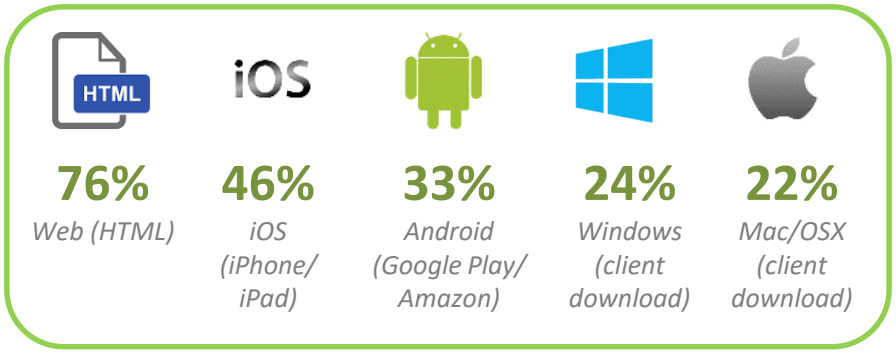


Most science edtech applicants focused on middle to high school content.

Note: A single company may fall under multiple subject areas and/or grades within the category

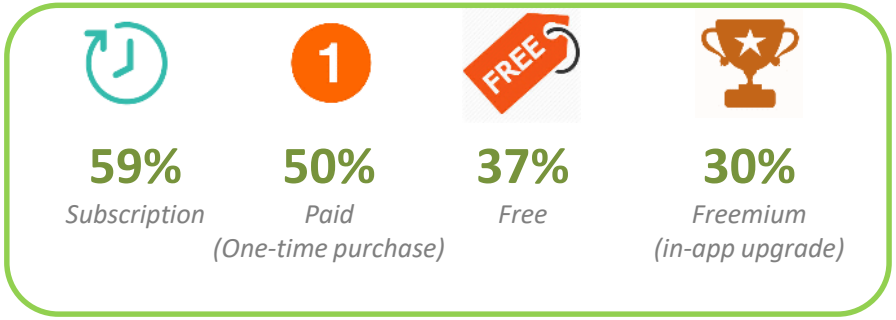
Science Learning Challenge applicants reflected science ed tech market trends

Platform†



Many offer their products within the web/HTML format. Roughly one-third operate on both web and mobile platforms.

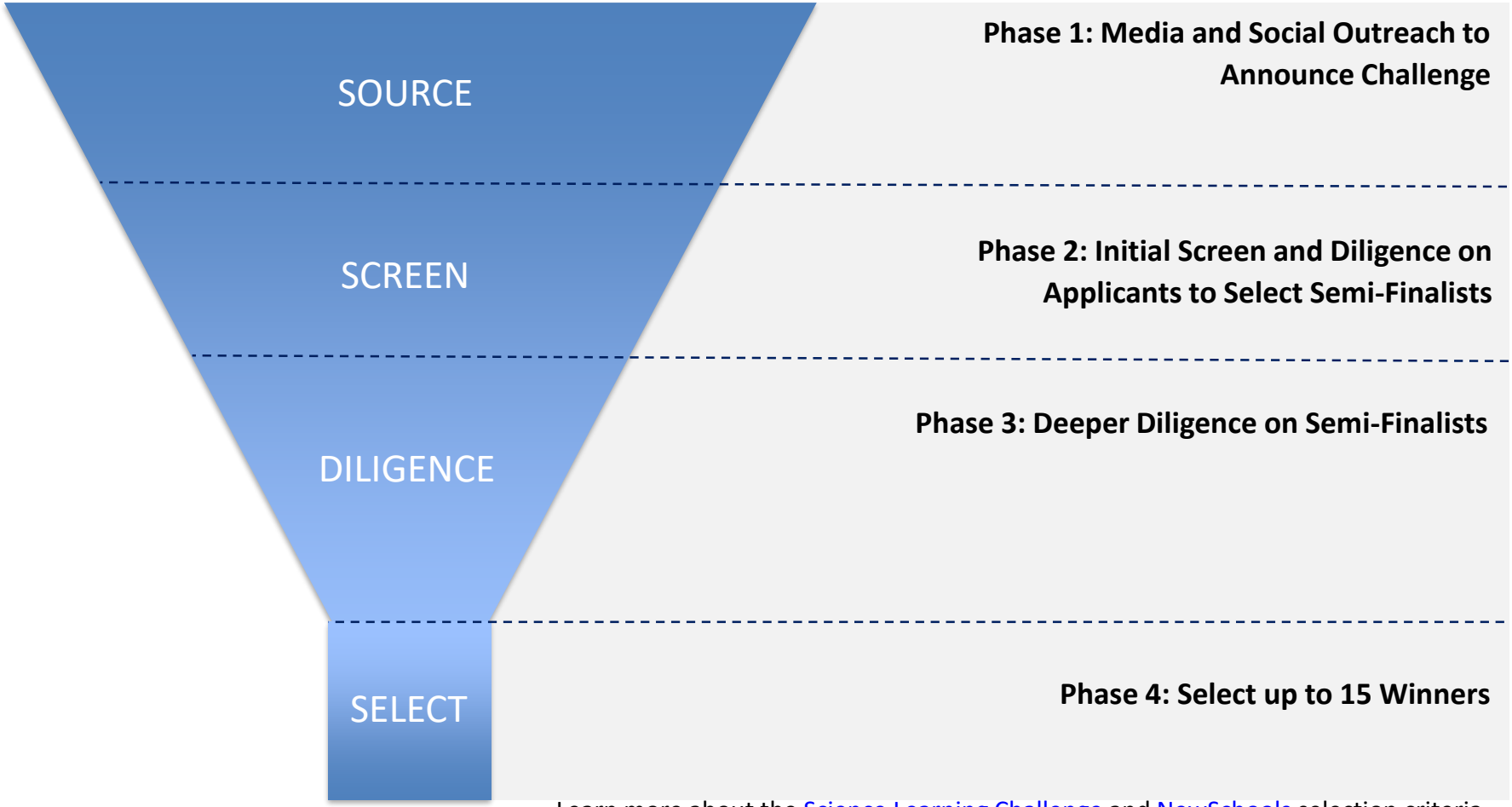
Pricing Model†



The subscription model is most commonly adopted by applicants.

Note: A single company may fall under multiple subject areas and/or grades within the category
†Remaining % marked as 'Other'

Science Learning Challenge winners were chosen through a rigorous selection process



Learn more about the Science Learning Challenge and NewSchools selection criteria

Challenge winners create hands-on activities and connection to the physical world

ARDUSAT

https://www.ardusat.com/

Ardusat brings space exploration to the classroom by making it possible to run code on satellites orbiting earth.

LAB4U

http://www.lab4u.co/

Lab4U is developing a set of apps that transform mobile devices into science instruments.

locorobo

http://www.locorobo.co/

LocoRobo is a digital and scientific literacy company that introduces students to the world of robotics and coding.

MAKERS EMPIRE

https://www.makersempire.com/

The Makers Empire makes it easy to effectively incorporate 3D design and printing into K-12 classrooms.

MudWatt

http://www.mudwatt.com/

MudWatt engages students in hands-on, inquiry-based STEM learning, using the power of mud!

Challenge winners deliver seamless access to valuable content for teachers and students

https://www.birdbrainscience.com/

BirdBrain Science is an adaptive platform that ensures students can read, grow, and learn independently.

http://noticing.nysci.org/

New York Hall of Science provides iPad apps that support play, design projects, and collaboration.

http://phet.colorado.edu/

The PhET Interactive Simulations provides innovations in teaching, learning, and assessment.

http://www.powermylearning.org/

PowerMyLearning Connect is a free K-12 platform for driving personalized instruction and self-directed learning.

http://www.science-bits.com/en/

Science Bits is a repository of multimedia science lessons designed to fire up your science class.

Challenge winners integrate multiple subjects and make learning more culturally relevant and inclusive

https://www.flocabulary.com/

Teachers use Flocabulary's hip-hop videos, activities and assessments to engage students.

https://www.mosamack.com/

Mosa Mack Science provides engaging supplementary curriculum with animated mysteries and activities.

http://www.nepris.com/

Nepris connects industry professionals with educators to bring real world relevance.

http://www.sciencewithtom.com/

Science with Tom features science role models and music videos where students write their own lyrics.

https://tuvalabs.com/k12/

Tuva is a data literacy company making statistics and data analysis accessible for learners.

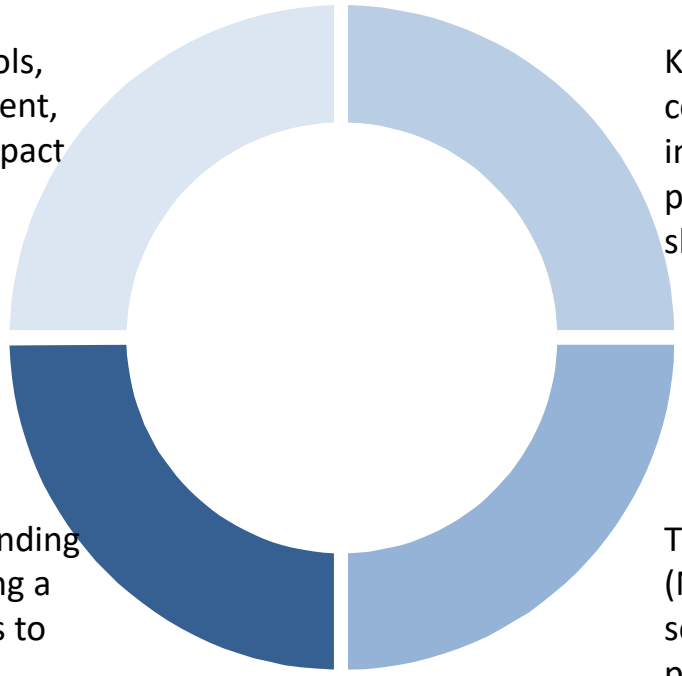
We believe ed tech can positively impact K-12 science learning

TECHNOLOGY

Greater broadband access in schools, lower costs for digital science content, and new, creative solutions will impact how science is taught

INVESTMENTS

K-12 ed tech investments have continued to grow, including greater interest within science, given the priorities to teach students 21st century skills



TEACHER VOICE

Teachers have been vocal in demanding more effective digital tools, creating a clear pathway for science products to address their needs

STANDARDS

The Next Generation Science Standards (NGSS) and similar standards help science companies build streamlined products across the nation

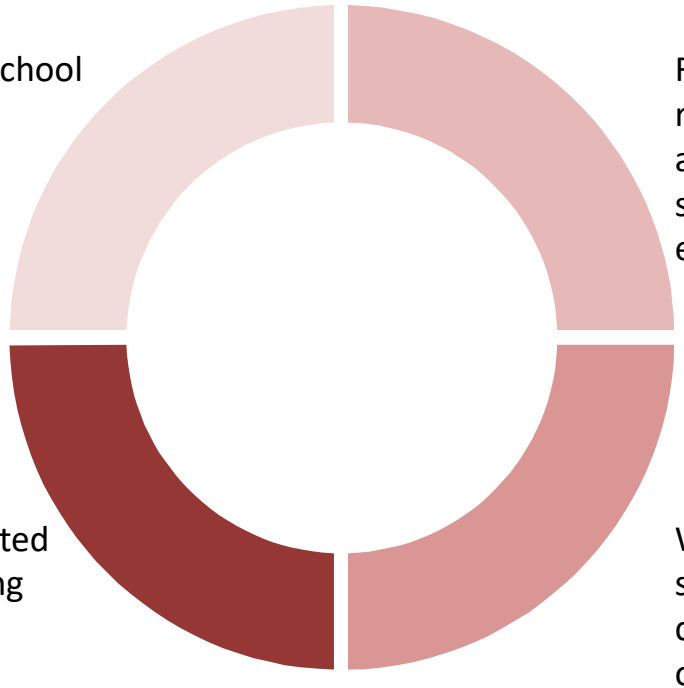
Challenging roadblocks to transforming science education

PRODUCT INTEGRATION

Science products must adhere to school requirements like single sign-on, security and data privacy, and compatibility with existing tools

RESEARCH

Resources and funds to conduct research studies are a huge barrier, but are key for determining the impact on student learning and for engendering educator and investor confidence



SALES PROCESS

Science companies face a fragmented school market with generally long sales cycles

FUNDRAISING

While there may be greater interest, science ed tech funding is at its infancy compared to school operation and other content products

We encourage different stakeholders to build and support science ed tech products

Investors

- Keep abreast of the science education landscape and innovative tools, especially those featured in educational websites and graduates of accelerator programs
- Invest in promising science ed tech products with the goal of supporting scaling efforts

Educators

- Identify primary areas where technology can reduce complexity and time and enhance student learning
- Connect with other educators on effective science tools
- Be open to trying out ed tech tools and offering product feedback
- Advocate for science products that create value and student outcomes

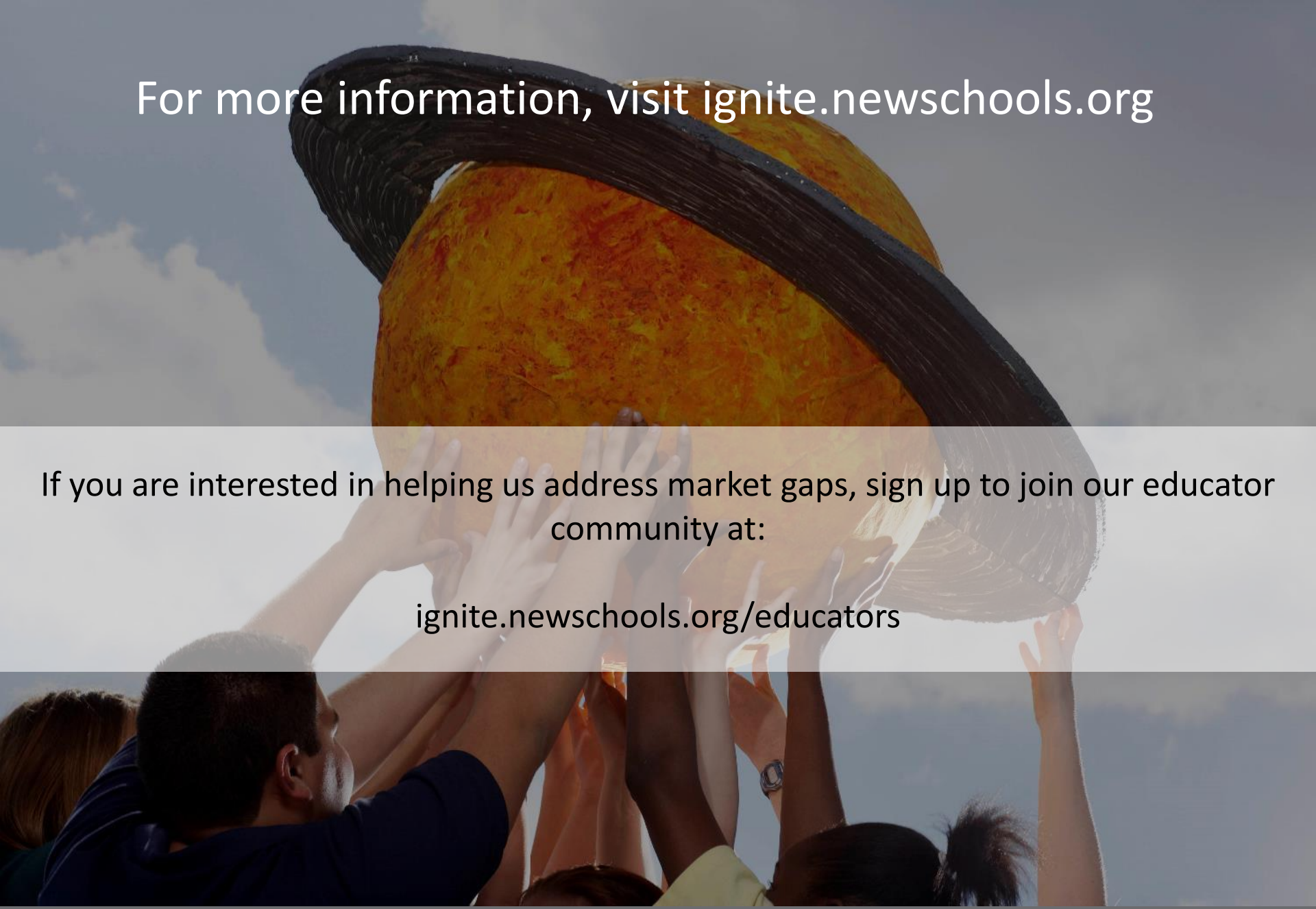
Edtech entrepreneurs

- Examine product offerings with items covered in our market research
- Identify ways to incorporate educator feedback and conduct research studies on the effectiveness of the product
- Determine ways to minimize implementation time/costs and teacher professional development commitments

Key Takeaways

1. Teachers see benefits to science tools, but struggle to find effective tools
2. Market research shows need for science digital tools
3. NewSchools launched the Science Learning Challenge to spur growth in science
4. Challenge winners are addressing the market gap, but more support is necessary to close it

For more information, visit ignite.newschools.org



If you are interested in helping us address market gaps, sign up to join our educator community at:

ignite.newschools.org/educators