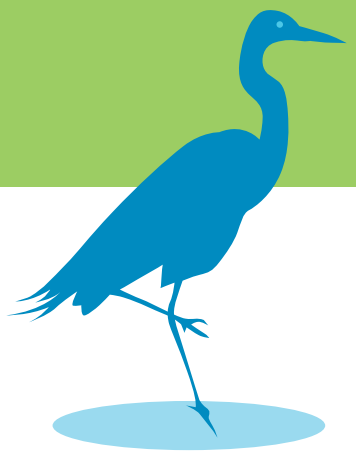
AFTERSCHOOL STEM HUB

A GUIDE TO THE

STEM Swamp



Understanding how Americans think and talk about learning — how it happens, where it takes place, and why it is important — helps communicators like you build a new narrative about afterschool and summer STEM programs. The STEM Swamp reflects which common assumptions the American public makes that keep the conversation "stuck" in place, as well as productive assumptions communicators can build on. Use this guide to interpret the STEM Swamp and get a head start anticipating how the public will interpret your messages.

STEM = SCIENCE

- Science Studies the World
- Science is Experimentation
- Science is Learned Everywhere
- Math = Adding + Subtracting
- Technology = Computers
- Computers + School = Danger/Distraction
- Engineering = HIGHLY Specialized

REFORM

- Fatalism
- Politics as Usual
- Flavor of the Month
- Nostalgia
- Zero-Sum

LEARNING

- Naturalism
- Hands-On
- Back to Basics
- Caring Teacher

WHAT'S IN THE SWAMP OF...

STEM and Informal STEM Learning

DIFFERENCES

- Drive
- Zero-Sum
- Cultural Differences
- "Types"

OUTCOMES

- Future Jobs
- Global Competition
- Societal Progress

LEARNING LOCATIONS

- Learning Hierarchy
- Rechargeable Attention
- Informal = Freedom and Low Stakes

The STEM Swamp is organized into six sections; each section contains a different group of "default" assumptions, or cultural models, about topics related to learning and education. The STEM Swamp was developed by FrameWorks Institute, and is a part of the Core Story of Education: a research-based reframing strategy for education communicators. Learn more about the STEM Swamp and the research behind it in the report, "The Power of Explanation: Reframing STEM and Informal Learning" (section II). You can also take a video tour of the STEM Swamp or download a PDF here: www.afterschoolstemhub.org/swamp.cfm

To learn more about what each of these sections of the STEM Swamp tell communicators about public perceptions, read on!

FRAME WORKS INSTITUTE

What is STEM?

THE PUBLIC SAYS: "STEM = SCIENCE"

One of the FrameWorks Institute's critical findings is that many people are not familiar with "STEM" as a term or concept. Even when STEM is explained, "science" stands out in the public's mind as a representation of all of the letters in STEM. Thinking about STEM as only science hides the fact that STEM is a set of interconnected fields and skill areas, as opposed being a single subject.

The public has existing cultural models for thinking about each of the STEM disciplines—science, technology, engineering, and mathematics. Unpacking these, the public has a stronger understanding of science and math and a more vague understandings of engineering and technology. Part of these cultural models is also how the public ranks the importance of STEM subjects. Generally, the public sees science and math as important skills to learn, while technology and engineering are seen as less essential. Let's take a closer look at some of these cultural models.

Science Studies the World: The public sees science as the study of the natural world, and assumes that it is a process of experimentation. This way of thinking leads people to value science and see the importance of hands-on learning.

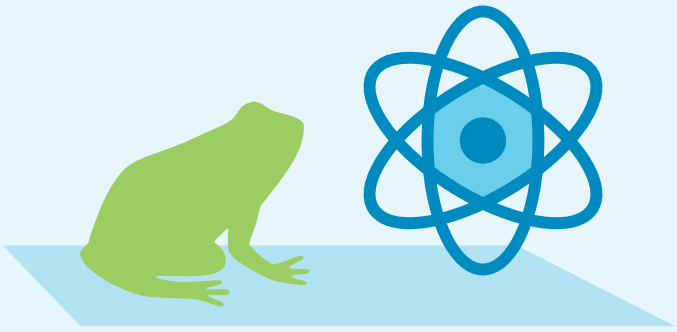
Science is Experimentation: This model explains the public's view of how science is learned. Thinking this way, science is about questioning old understandings and developing new knowledge about how things work.

Math = Adding + Subtracting: The public sees math as an important skill, but at the same time reduces math to basic operations like addition and subtraction. This model also shows the public perception that math skills are most commonly connected to "basic" functions, like counting change and balancing a checkbook as essential skills.

Technology = Computers: Americans commonly see technology as equivalent to computers, or search engines. Instead of seeing technology as a subject, people understand technology as objects that people use or tools for communication. Technology as a creative subject that can address and respond to human needs in the physical world is absent from Americans' understandings.

Computers + School = Danger/Distraction: The public's reaction to technology in educational environments is often negative. While using technology is seen as a skill for children, the public also sees our society's reliance on technology as dangerous. The public also has concerns that the internet and digital spaces are dangerous for children, and worry that giving students technology can get them into trouble or lead to cyber bullying. Technology is also often seen as a distraction.

Engineering = HIGHLY Specialized: Instead of being seen as an important skill for all children to learn, engineering is considered a highly specialized skill that only children with specific abilities and talents can learn.



Why does STEM learning matter?

THE PUBLIC SAYS: "IT'S ABOUT THE FUTURE"

OUTCOMES:

Future Jobs: Americans consistently connect science and STEM learning outcomes to economic success. The Future Jobs cultural model describes how possessing STEM skills helps individuals secure better, higher-paying jobs. This belief matches other FrameWorks' findings that the purpose of education in general is individual financial gain.

Global Competition: In addition to seeing STEM skills as tools for getting higher-paying jobs, developing STEM skills is understood as a way for the United States to stay competitive and dominant in the global economy. While this way of thinking about STEM may seem helpful, it actually allows people to start thinking fatalistically about America's future; if we need to remain competitive, there must be a large obstacle in the way of the country's success.

Society Progress: Americans are able to see how STEM education and training a new generation of STEM professionals can improve the entire country's quality of life. Collective thinking about STEM education helps explain STEM as an important part of social progress.

Image provided by The 50 State Afterschool Network

How are STEM skills learned?

THE PUBLIC SAYS: "LEARNING HAPPENS IN CERTAIN WAYS AND IN CERTAIN SETTINGS"

LEARNING: HOW IT HAPPENS

Naturalism: Learning is seen as a normal part of growth that happens naturally as children get older. The problematic part of this cultural model is that since learning is inevitable it can render "extra" STEM learning opportunities, supports, and curricula unnecessary.

Hands-On Learning: One positive result of people equating STEM with science is the assumption that STEM subjects should be learned the same way that science should be—by experimenting, observing, and trying new approaches. This alignment between STEM learning pedagogy and the public's view of how STEM should be taught is an important opportunity for STEM communicators and advocates.

Back to Basics: The assumption that learning should focus on the foundational basics is a deeply held and dominant model for education. Skills like reading, writing, and computational math are seen as the skills children need to learn before moving on to more complex topics. In this model, the assumption is that children learn subjects like engineering and technology at the expense of foundational skills. Additionally, the country's educational problems are blamed on moving away from a narrow focus on the basics.

Caring Teacher: The impact that education systems have on learning can be hidden from public view. As a result, teachers who "care more" are seen as the solution to improving the quality of education. Looking at how to improve education in this way distracts from discussions about the supports and resources that ultimately influence teacher quality.

LEARNING LOCATIONS: WHERE AND WHEN IT HAPPENS

Learning Hierarchy: Americans recognize the value of informal learning. However, the persistent assumption that informal learning is not an essential part of learning creates a hierarchy between formal and informal learning. This way of thinking positions informal learning opportunities as supplements to formal learning contexts.

Rechargeable Attention: Children's energy is understood as a limited resource where periods of learning need to be followed by opportunities for children to recharge and regain their energy. Recharging happens during periods of downtime that do not involve learning. In this model, informal learning opportunities drain the children's finite energy that they need to devote to formal learning.

Informal = Freedom and Low Stakes: Freedom, flexibility, and lack of pressure are understood as the key characteristics of informal learning. Americans see these features as positive and especially important for science learning.

Q What's the problem, and why can't we do anything about it?

THE PUBLIC SAYS: "IT'S ABOUT EFFORT AND DIFFERENCES BETWEEN LEARNERS"

REFORM: REACTIONS TO NEW "EDUCATION SOLUTIONS"

Fatalism: Fatalistic responses to talking about social issues suggest that some problems are too big to solve and nothing can be done. When extended to talking about education reform, the public believes nothing can be done to improve educational outcomes so it is not worth trying to create change.

Flavor of the Month: Tapping into fatalistic thinking about education reform, this model sees STEM education as a trend that is unlikely to succeed, and will soon be replaced by a new trend.

Nostalgia: Many Americans imagine a "simpler" time, in which the distractions caused by technology were absent. This mode of thinking can be applied to pedagogy as well, when people voice support for the "old ways" of teaching over other approaches.

Zero-Sum: In this model STEM learning takes time away from foundational subjects like reading and math. The tendency towards this thinking can fuel resistance of curricular changes.

DIFFERENCES: WHAT EXPLAINS STUDENT SUCCESS

Drive: The public sees individuals' personal drive and talents as the cause of disparities in student success, rather than systemic inequality and structural differences in learning opportunities.

Zero-Sum: Presenting afterschool programs as targeted towards certain groups can call up unproductive thinking about community and educational resources. In short, the public believes there are automatically fewer resources for groups that they are a part of when another group is offered targeted benefits.

Cultural Differences: The public also views individual differences in drive as the source of disparities to perceived or imagined "cultural" differences between groups. These differences can fall along racial, ethnic, and gender lines, and are often based on stereotypes.

"Types": While experts see STEM learning as beneficial to all children, the public believes that only certain kinds of students can successfully develop STEM skills. The public assumes that STEM learning is most appropriate for students with the right talents. For example, "math and science kids" are considered special kinds of students who are more disposed to learning STEM skills.