

STEM Learning

A Lifelong, Life-Wide View



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Big Picture



- Learning is lifelong: 24-7-70+
- Less than 3% of life spent in formal instruction
- Traditional gatekeepers of knowledge – schools, libraries, government – no longer in total control.
- The boundaries between where, when and why we learn are disappearing
- Learning is continuous & cumulative

People Learn STEM (in order of time spent)

1. Satisfy Personal Curiosity/Interest
2. On-the-Job Experience/Training
3. For a Hobby
4. To Support the Needs of Others (e.g., children, significant other)
5. Satisfy a Specific Need/Problem (illness, environmental problem, repair, etc.)
6. For School, or Prepare for a Career

Most STEM Learning is Free-Choice Learning

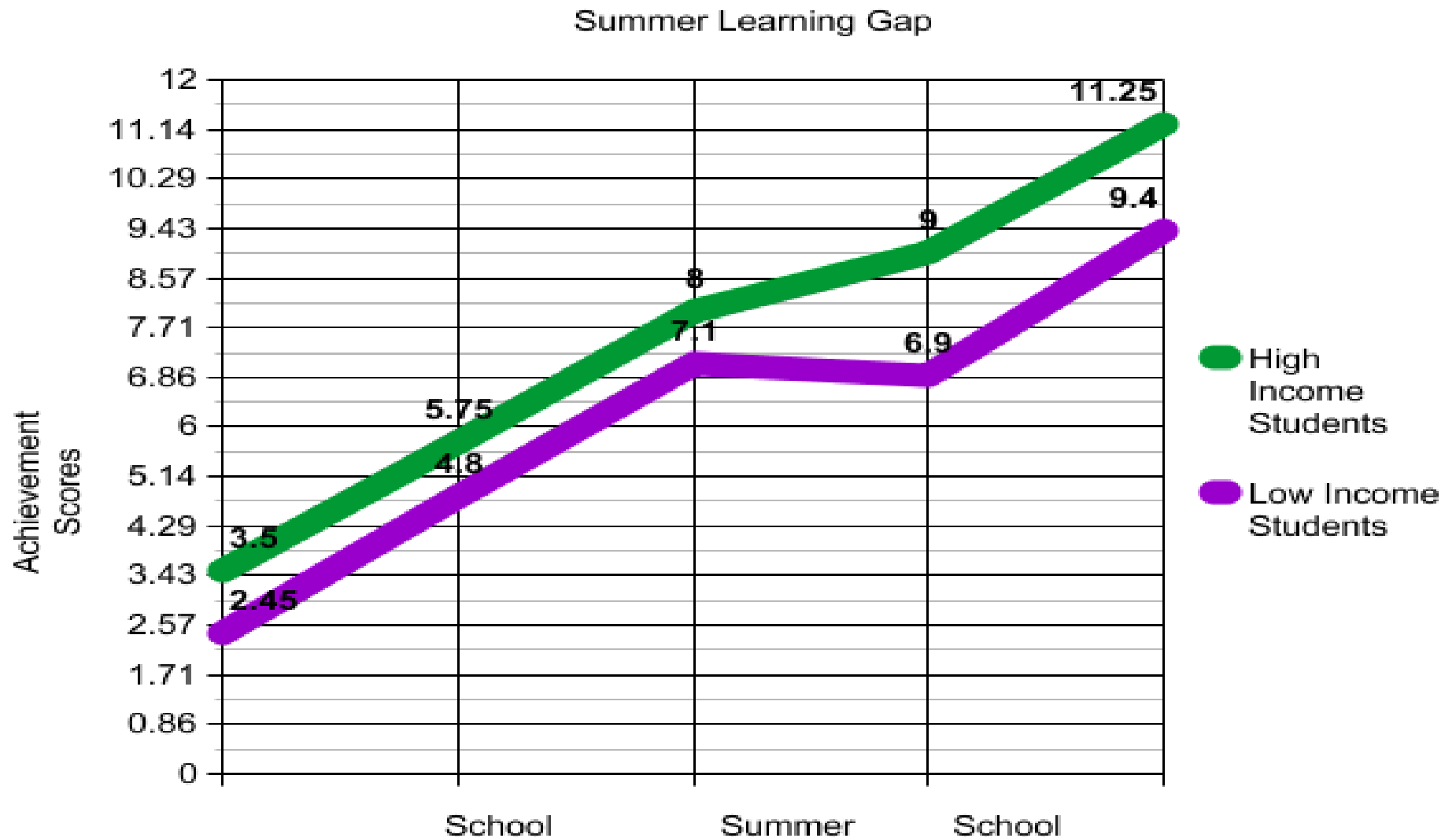


Learning that people do when they have some control over what, where, when, why and with whom they learn.



**But Don't People Learn Most of
Their STEM in School?**

Myth #1: “Good” vs. “Bad” Schools



Von Hippel et al, 2007

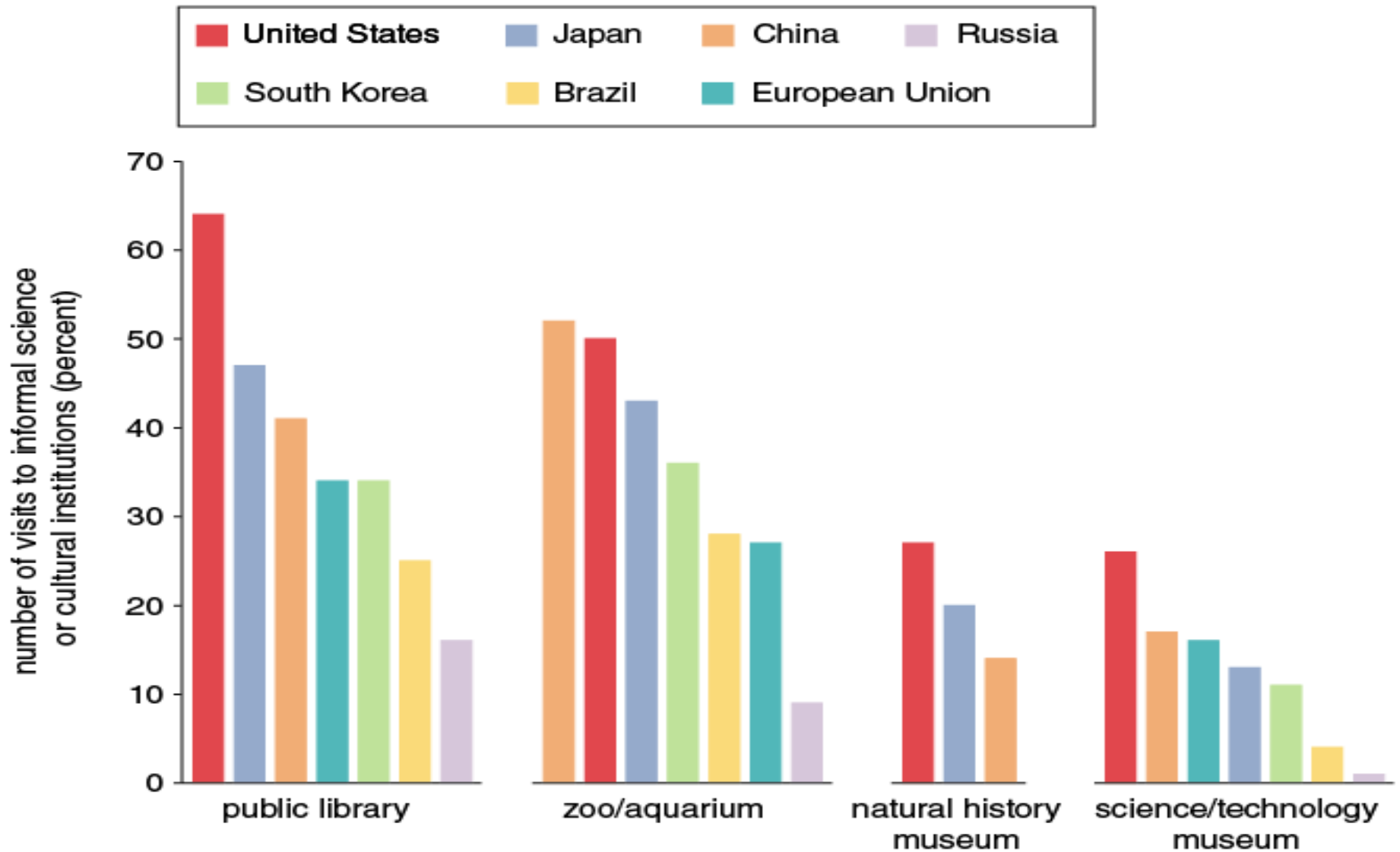
Myth # 2: U.S. Compared to World

- At grade 4, the U.S. was # **7** in the world in science.*
- At grade 8, the U.S. was # **23** in the world in science.*
- As Adults, the U.S. was # **1** in the world in public understanding of science.**

Schooling can't explain this U-Shape result?

* TIMMS (2012) ** National Science Board (2011)

Use of Informal Science Venues



Sources of Information (2015): General Science Knowledge

1. 80% Television/Electronic Media
2. 79% Internet*
3. 73% Books, Magazines, not for school
4. 64% Science Museums, Zoos & Aquariums
5. 45% Family and Friends
6. 37% Work/On-the-Job training
7. 25% Radio
8. 20% School Courses**
9. 11% Hobby/Club

* 3% 1997, 10% 2000, 24% 2007 ** 53% 1997, 46% 2007, 24% 2009

Regression Analysis

Predicting Science Knowledge

	R ²	X ² -value	p-value
Formal Education Model	0.17	133.08	< .001
Childhood Free-Choice Learn. Model	0.17	122.61	< .001
Workplace Model	0.20	152.61	< .001
Privilege Model	0.23	152.95	< .001
Adult Free-Choice Learning Model	0.39	323.95	< .001

Overall Model: R² = 0.51, X² = 369.43, p < .001

Falk & Needham (2013)

Summing Up

- STEM learning is continuous and cumulative.
- Most STEM learning is driven by individual needs and interests.
- Free-Choice/Non-School experiences are increasingly central to public's STEM learning.

