

The Value of “Soft Skills” for Software Engineers

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It's almost *that* time again!



Advice from the Career Center...

“It is not enough to say that you have technical and/or soft skills (organizational, teamwork, clerical, interpersonal, communication, etc.). These skills should be highlighted in your experience on the resume.”



Investopedia defines hard & soft skills

Definition of Hard Skills:

“Specific, teachable abilities that can be defined and measured. By contrast, soft skills are less tangible and harder to quantify. Examples of hard skills include job skills like typing, writing, math, reading and the ability to use software programs; **soft skills are personality-driven skills like etiquette, getting along with others, listening and *engaging in small talk***. In business, hard skills most often refer to accounting and financial modeling.”

A brief summary

If you want an edge in the job market, emphasize on your resume that you are good at engaging in small talk.



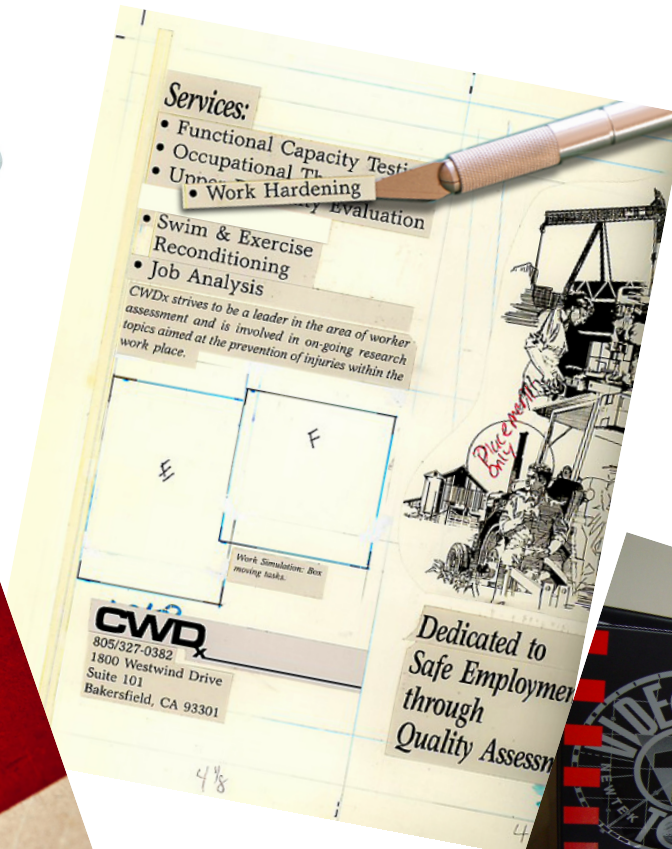
The argument against hard skills

- Hard skills tend to be domain specific
 - Inflexible
 - More easily defined, outsourced, or automated
 - Prone to obsolescence as technology advances
 - Examples include the Ada programming language



My experience with obsolete tech

(BFA Communications Design, Pratt, 1982)



The argument for soft skills

- Soft skills are independent of context
 - Flexible
 - Hard to define or readily replace
 - Enduring
 - A “force multiplier” for any technical skill set



The stereotypes:

“Hard” and “Soft” skills

- **Hard Skills**

- Technical, analytical, hard
- Math, Science, and Engineering
- Marketable, lucrative
- Boring
- For smart people with low social skills who work hard (*geek*)

- **Soft Skills**

- Creative, intuitive, easy
- Poetry, Art, History, Music, Theater
- Likely to leave you unemployed, low pay
- Fun
- For slackers who like to party and dream a lot (*reality intern*)

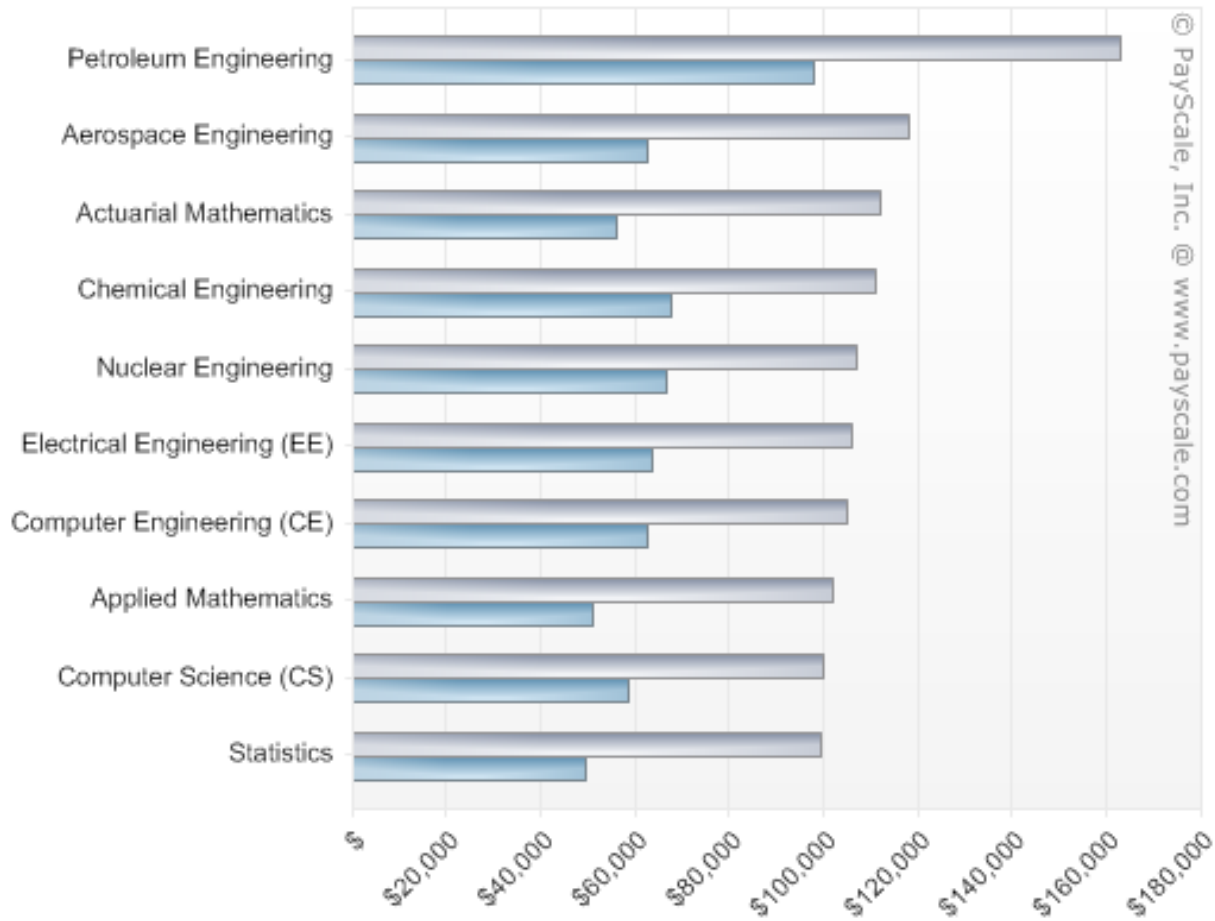
Hard Skills



Soft Skills



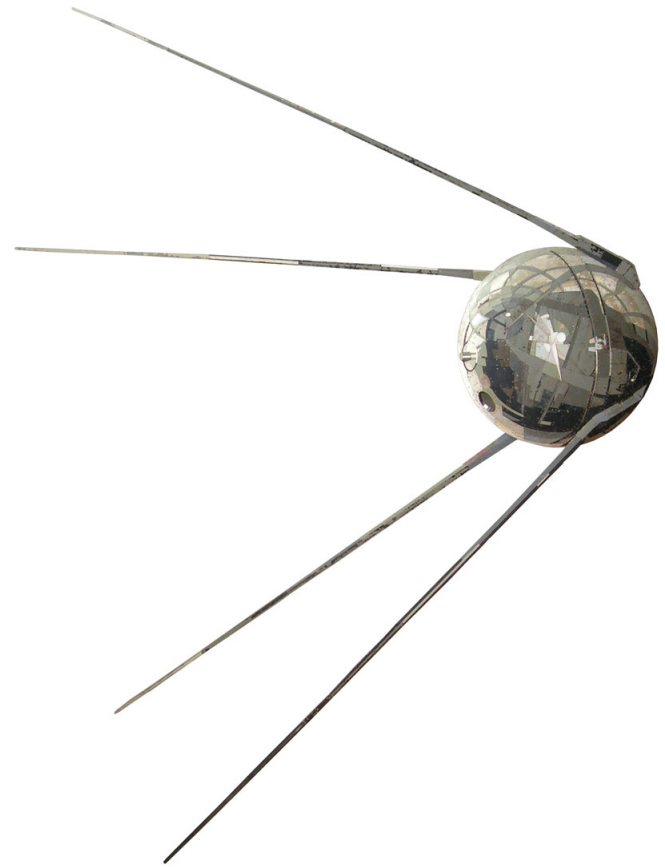
And here's the data:



So where did this bias come from?

The National Defense Education Act (1958)

"An Act To strengthen the national defense and to encourage and assist in the expansion and improvement of educational programs to meet critical national needs."



Sputnik, the world's first satellite, launched by the USSR

A persistent educational bias favoring STEM

- Increased standardized testing
 - Emphasis on only quantifiable outcomes
- Decreased budget allocations for art and music programs

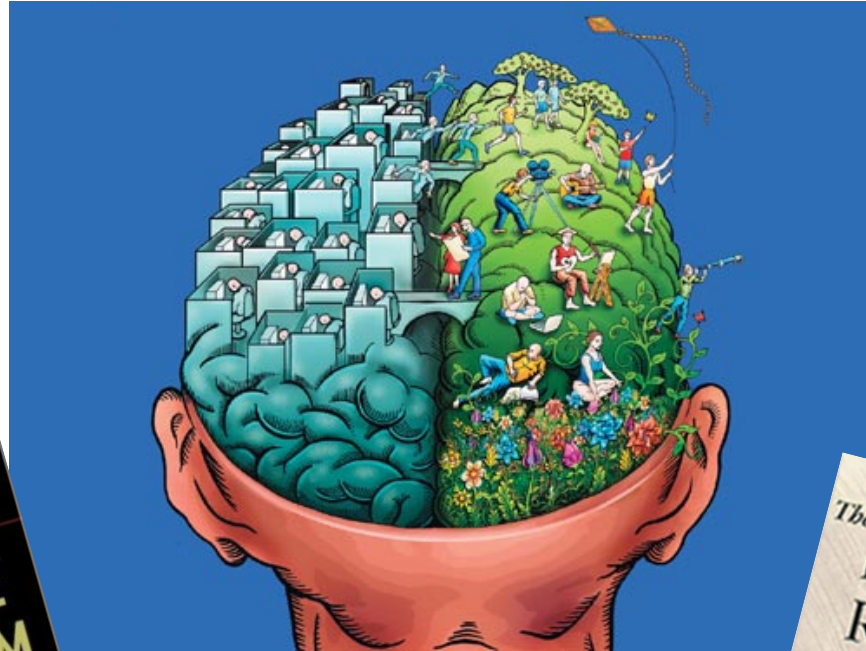
Lateralization of brain function

- Based on the epilepsy research of Roger W. Sperry (who received the Nobel Prize in 1981).
 - Cutting the corpus callosum (the structure that unites the brain's two hemispheres) reduced seizures
 - A side effect of the procedure indicated that many language functions reside primarily in the left hemisphere
 - The popular press extrapolated the findings to establish pseudoscience myth of “right brain” and “left brain” types of thinkers

Left Brain and Right Brain

Left Brain:

Language
Logic
Critical thinking
Numbers
Reasoning

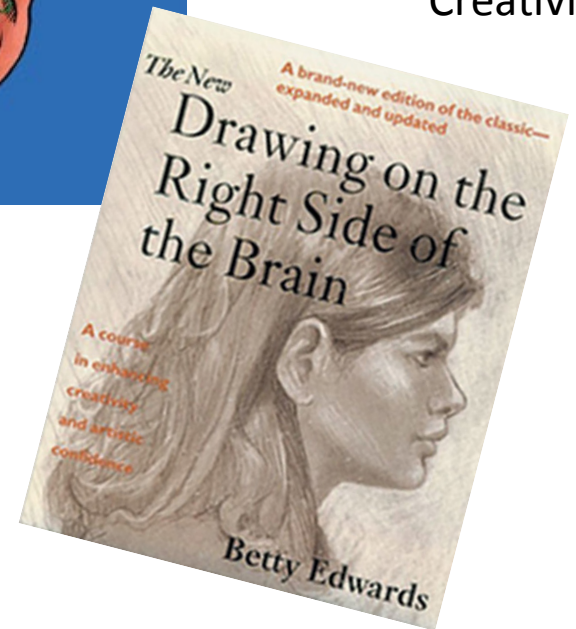


Right Brain:

Recognizing faces
Expressing emotions
Music
Color
Images
Intuition
Creativity



So what type are you?



The actual neuroscience

- Psychologists and neuroscientists have recognized two specific types of intelligence for many decades, and use two different IQ tests to measure them
- **Crystallized Intelligence**
 - Based on long term memory
 - Related to **vocabulary and practice**, access to discrete facts
 - Accumulated life experience
- **Fluid Intelligence**
 - Based on working memory
 - Related to **pattern recognition** and problem solving, particularly novel problems

IQ tests

Crystallized IQ: What's the answer?

1)
badinage | banter
same opposites neither

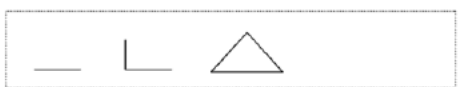
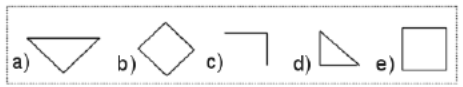
2)
halcyon | masticate
same opposites neither


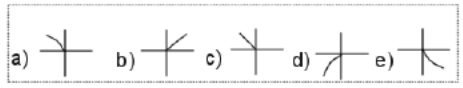
3)
aphorism | adage
same opposites neither


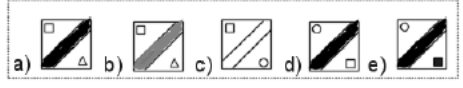
4)
obdurate | lissome
same opposites neither

5)
torpid | lively
same opposites neither

Fluid IQ: What's the question?

1)


a) b) c) d) e)

2)


a) b) c) d) e)

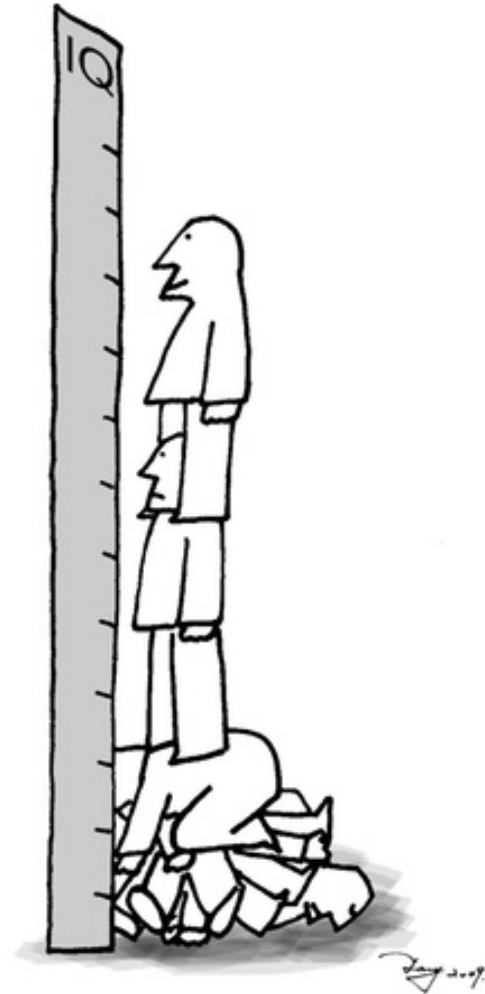
3)


a) b) c) d) e)

The relationship between Fluid IQ and Crystallized IQ

- Fluid IQ is malleable in childhood, peaks in young adulthood, and begins to decay in the 30's
- Crystallized IQ accumulates and can increase throughout an individual's lifetime
- **Fluid IQ and Crystallized IQ are codependent and mutually reinforcing - an increase in Fluid IQ is reflected by an increase in Crystallized IQ**
- Recent studies suggest that both measures of IQ are at most a 50% genetically determined *range*, implying that IQ is an asset that can be enhanced over time

But can Fluid IQ be increased?

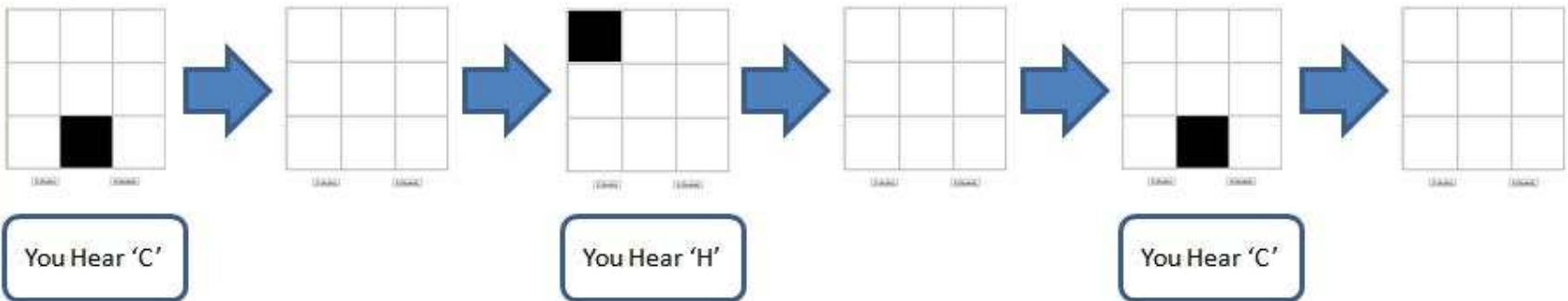
The **dual n-back exercise** has been shown to increase working memory, and therefore Fluid IQ. However, the task is repetitive and boring. Is there a better way?



Dual n-back games



An Example Of The 2-Back Game



Correct Response: Press K and D before the last "blank" grid disappears, since you saw the same spatial pattern and heard the same sound two steps ago.

Neuroeducation

“Arts integration is also important from a national, macroeconomic perspective: **graduates are entering the workforce without critical skills that arts-based learning is known to promote—collaboration, creative problem-solving, and the ability to apply learning across different disciplines.** Further, exposure to the arts as a participant or observer has the potential to have profound effects on learning and memory, context, and comprehensive creative thinking.”

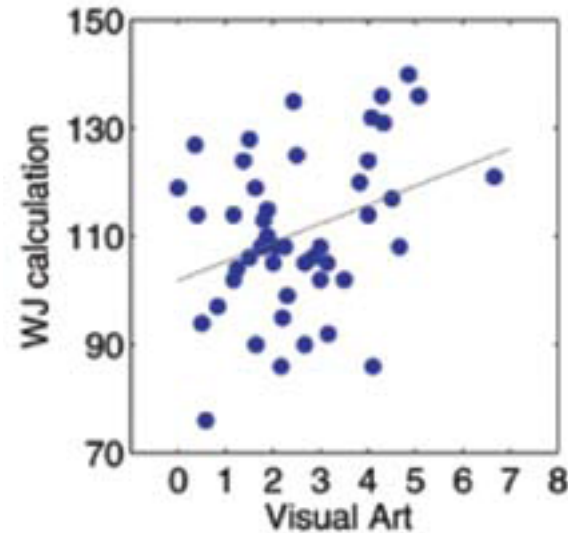
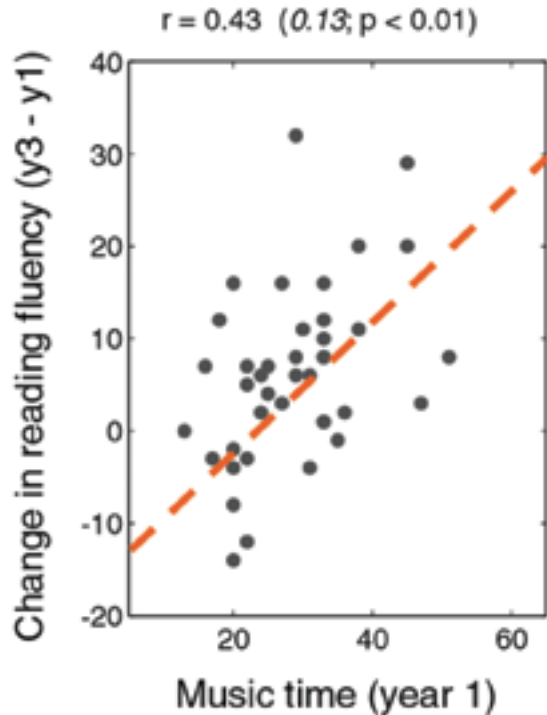
- From Neuroeducation: Learning, Arts, and the Brain (Executive Summary)

The arts and IQ

“Performance or practice of any of the art forms changes the neural networks performing that art form. There is very little dispute about the existence of these networks and that they change with practice. **Years of neuroimaging have now given us a plausible or putative mechanism by which arts training could now influence cognition, including attention and IQ.**”

- Dr. Michael Posner, Professor of Psychology,
University of Oregon

Crossover benefits of arts training



Music provided the strongest correlation between arts training and reading. The music training explains 16% of the variance in children's scores. The horizontal axis shows lifetime hours of music training; the vertical axis shows the improvement in reading fluency between years one and three.

We incidentally discovered that visual art experience is correlated with math skills. The horizontal axis shows a weekly average of hours spent on visual art activity in school (year one). The vertical axis shows a measure of math skill. **The correlation explains 10% of the variance in children's scores.**

We've sort of known this for a while...



What does everyone say they want?

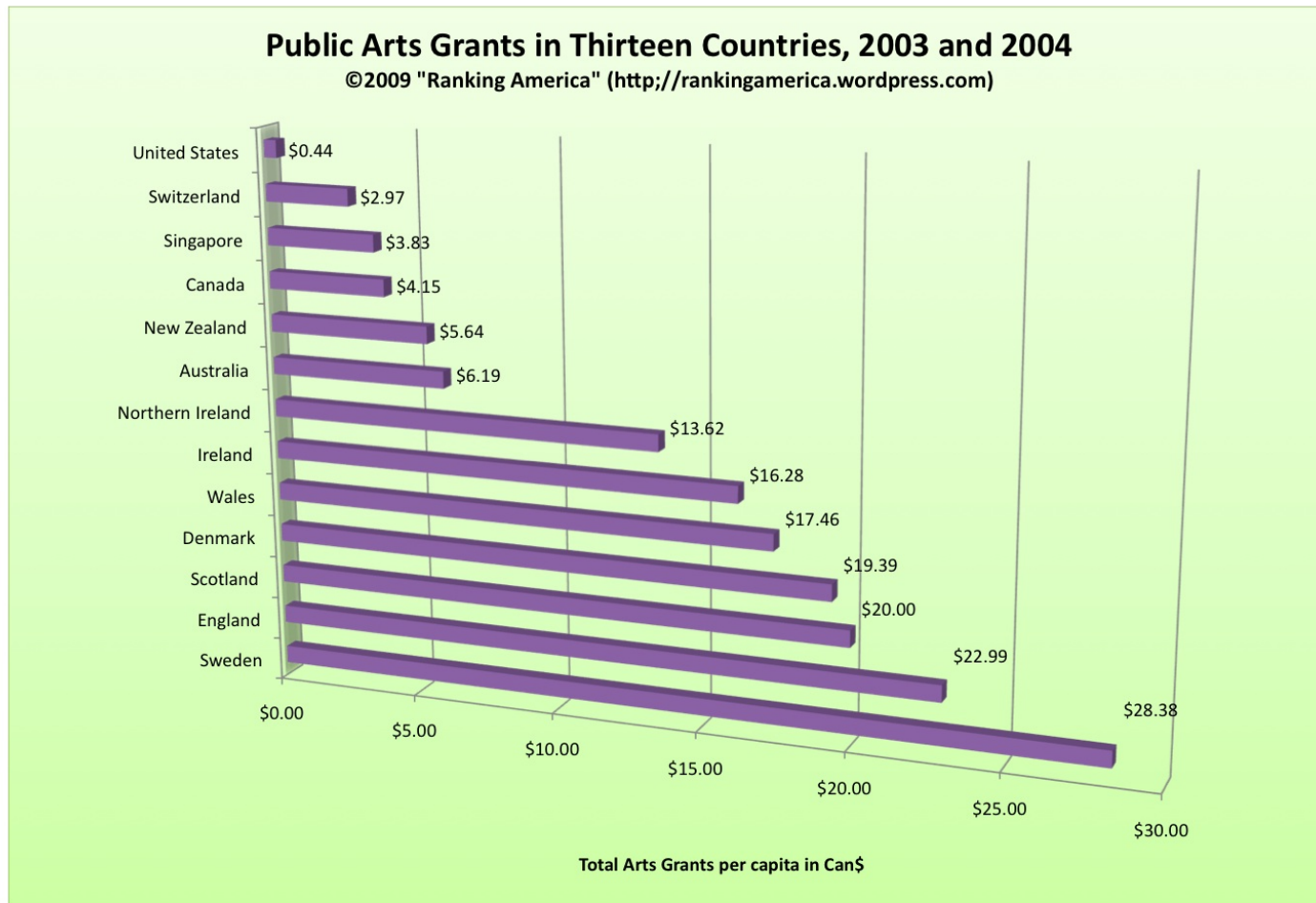


Innovation Nation

"The first step in winning the future is encouraging American innovation. None of us can predict with certainty what the next big industry will be or where the new jobs will come from. Thirty years ago, we couldn't know that something called the Internet would lead to an economic revolution. **What we can do** -- what America does better than anyone else -- **is spark the creativity and imagination of our people.**"

- President Barack Obama, January 25, 2011

Just sayin', Mr. President



Show us something that works!

“Finland is one of the most innovative economies in the world, and it is the only country where students leave high school ‘innovation-ready.’ They learn concepts and creativity more than facts, and have a choice of many electives — all with a shorter school day, little homework, and almost no testing.”

- Tony Wagner, Innovation Education Fellow at the Technology & Entrepreneurship Center at Harvard University

A new world

“Gone are the days when lawyers and doctors and computer programmers excel without incorporating design, story, sympathy, empathy and meaning in their work.”

- Daniel Pink, author of “A Whole New Mind”

Ed Catmull weighs in



The poetry of programming

“Writing code certainly feels very similar to writing poetry. When I'm writing poetry, it feels like the center of my thinking is in a particular place, and when I'm writing code the center of my thinking feels in the same kind of place.”

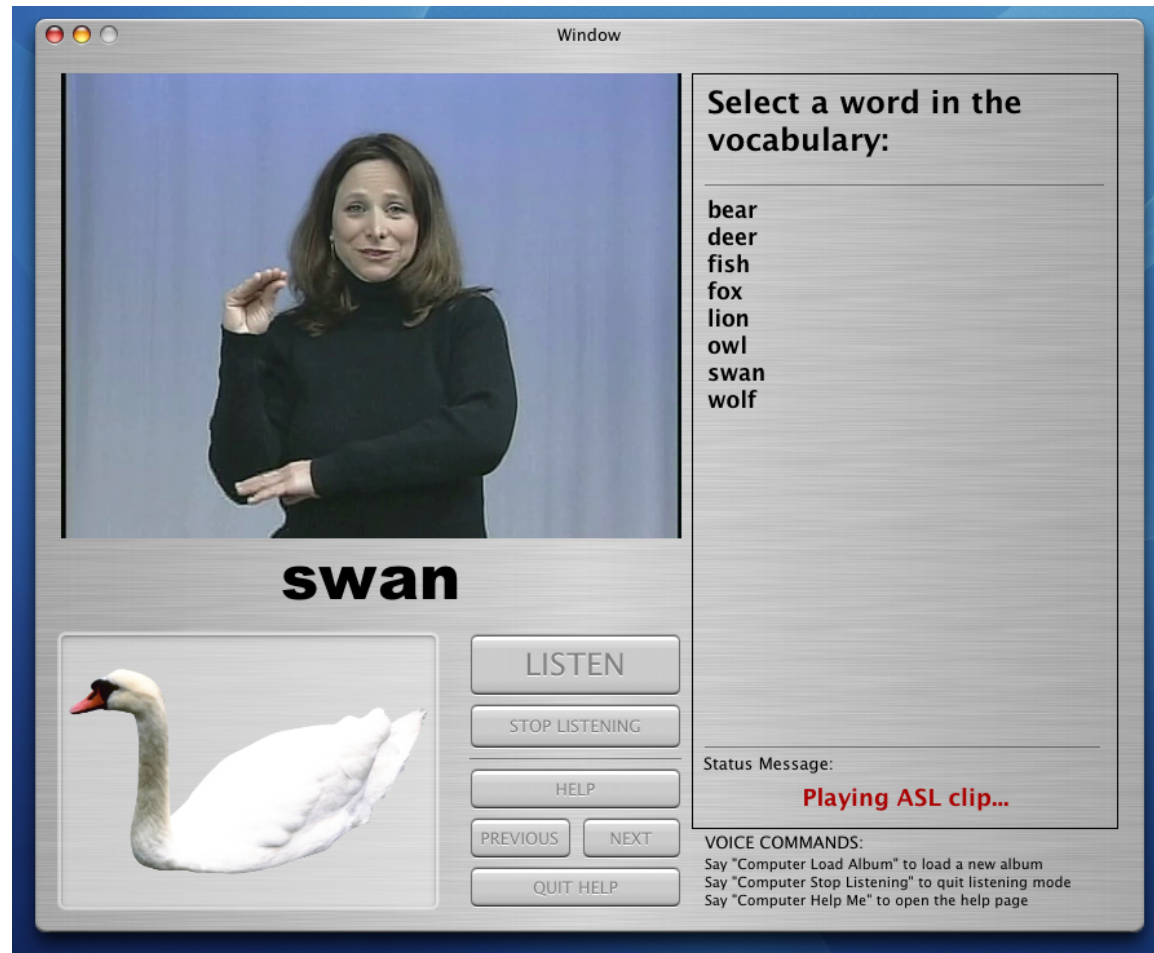
- Richard Gabriel, Distinguished Engineer at Sun Microsystems

What a preposterous idea!



Google Games – Software engineering teams building with Lego blocks, not code blocks.

What a preposterous idea!



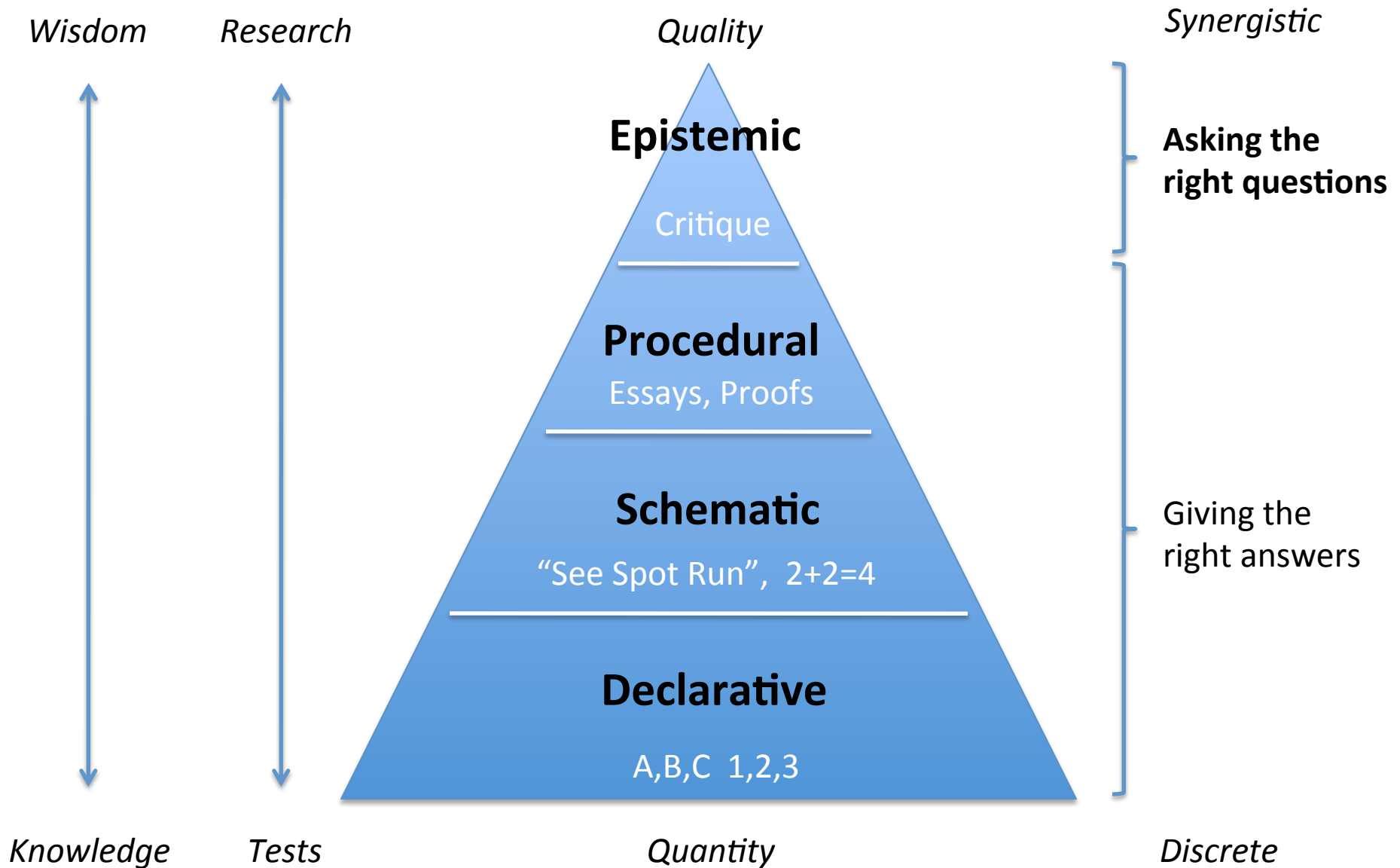
iSign - Reading aloud to a hearing impaired child.

What a preposterous idea!

The image displays the SmartStep math game interface. On the left, a green chalkboard shows the division problem $40 / 5$. Below it is a grid of nine numbered buttons: 5 (red border), 1 (green border), 3 (blue border) in the top row; 4 (yellow border), an empty green cell, 10 (purple border) in the middle row; and 8 (brown border), 7 (purple border), 6 (brown border) in the bottom row. On the right, three panels show a green frog on a rock with a timer of 07:12, a green frog on a rock with the number 3, and an orange frog on a rock with the number 0. The word 'exit' is visible in the bottom right corner.

SmartStep – Dancing to solve math problems.

From Knowledge to Wisdom



A brief summary

- **Soft skills** are the intellectual processes that drive innovation
 - Multidisciplinary
 - Synthetic
 - Collaborative
 - Iterative
 - Comfortable with ambiguity and error
- **Hard skills** are the distilled intellectual assets that fuel innovation
 - Vocabulary
 - Process and practice
 - Emphasis on efficiency of execution

A brief commentary

- The claim that there are “creative types” and “technical types” has no basis, and could be considered discriminatory
 - Women’s work (Teacher, Nurse, Designer)
 - Differential pay
- The investment bias in favor of STEM actually constrains STEM educational outcomes

Time for Grad school

1. Keep a journal.
2. Draw or doodle daily.
3. Unplug completely. Go for a long walk.
4. Expose yourself to new stimuli. Listen to new music, go to a gallery or museum, cook something different.
5. Take up a craft.
6. Maintain your contacts and reach out to new communities.
7. Change your routines occasionally.
8. Adopt a genius you admire (read a biography).
9. Donate your time and talent to a cause you believe in.

Any questions?

“Judge a man by his questions rather than his answers.”

- Voltaire

Resources

“Can You Make Yourself Smarter?”, By Dan Hurley, NY Times, 4/18/2012

<http://www.nytimes.com/2012/04/22/magazine/can-you-make-yourself-smarter.html>

“Improving fluid intelligence with training on working memory”, Susanne M. Jaeggi, Martin Buschkuhl, John Jonides, Walter J. Perrig, Proceedings of the National Academy of Sciences, 2/7/2008

<http://www.pnas.org/content/early/2008/04/25/0801268105.abstract>

“Neuroeducation: Learning, Arts, and the Brain”

<http://www.dana.org/news/publications/publication.aspx?id=23964>

“A Conversation With Ed Catmull”, ACM Queue, 11/1/2010

<http://queue.acm.org/detail.cfm?id=1883592>

Tony DeRose talk at the Simons Center 3/7/2013

<http://scgp.stonybrook.edu/archives/6552>