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What WWII Pilots Can Teach Us About Maths Education

By Robert Sun



Last March, 34 years after its predecessor program became the most viewed series in PBS history, *Cosmos: A Spacetime Odyssey*, hosted by Neil deGrasse Tyson, began its mission to introduce a new generation of viewers to the wonders of the universe. No less a fan than President Obama opened the first episode, saying that “there are new frontiers to explore, and we need Americans eager to explore them.”

President Obama has long been a proponent of education, particularly the STEM (Science, Technology, Engineering and Mathematics) fields. His fiscal 2015 budget, recently released, proposes \$2.9 billion in programs across the Federal Government in support of STEM education, including \$40 million to prepare 100,000 STEM teachers over the next decade and \$20 million to launch a pilot STEM Master Teacher Corps.

Will the federal government’s ambitious plans to improve STEM education succeed or fail?

Another chapter from US history might uncover the answer. More than seventy years ago another Democratic president, Franklin Delano Roosevelt, faced a similar challenge—the urgent need to quickly produce 100,000 competent pilots to fight in World War II. FDR’s dilemma was no less daunting, as early aviation schools had fatality rates as high as 25 percent. With that kind of abysmal failure rate, did it make sense to pour vast amounts of money into producing more flight instructors? Or was it better to ask the question: “Is there a better way to learn to fly?”

As Daniel Coyle recounts in his book, *The Talent Code*, “the answer came from an unlikely source: Edwin Albert Link, Jr., the son of a piano and organ maker from Binghamton, New York, who grew up in his father’s factory.” Link had a fascination for flying and took his first flying lesson at age 16. On his first training flight he spent an hour in the air, but landed without ever once getting his hands on the controls. He concluded there had to be a better way to learn how to fly. This idea gnawed at him, and he tink-

ered in his father's factory for seven years before building what later would become known as the "Link Trainer."

The Link Trainer was basically a flight simulator—a tool that enabled untrained youth to practice learning how to fly in a low-risk environment. The Army Air Corps secured ten thousand Link Trainers and by the end of the war, more than 500,000 pilots had logged millions of practice hours. The Link Trainer, coupled with improved teaching methods, allowed us to meet the challenge.

We need the equivalent of the Link Trainer in mathematics if we are to meet the present challenge. I have been involved in helping children build a solid foundation in mathematics for more than two decades. My observation is that the problem we face is not on the teaching side. There is nothing wrong with the way the US has taught maths since the 1940's. Generations of American children, schooled over the past 70 years in maths, have put men on the moon and invented the integrated circuit chip, among thousands of other innovations.

I believe our nation's fixation on teaching as the sole solution to building our children's maths skills is misplaced. The US ranks low internationally in maths competency because our youth do not practice.

I don't know of any acquired skill, with the possible exception of breathing, that you can master without practice. Even learning to walk requires diligent practice. The average toddler will take 3,000 steps and fall more than 18 times in one day. Why should maths be the outlier—the one skill you can master without practice?

According to the Organization for Economic Cooperation and Development's most recent PISA study, the United States ranks 32 out of 65 countries in mathematics proficiency. Those at the top include the Chinese, specifically children in Shanghai and Hong Kong. Do these Chinese students have a maths gene that accounts for their success?

The answer, not surprisingly, is no. The reason Shanghai ranks number one is because practice is embedded in the Chinese culture. The Chinese word for learning/study is made up of two characters: The first character stands for "accumulation of knowledge" and the second character stands for "constant practice, as in little birds learning to fly."

If President Obama is to succeed, my belief is that he should follow FDR as well as China and other top-performing Asian countries like Korea and Japan. Spending millions to build a corps of master maths and science teachers is a laudable effort. But if we want real tangible results, we must give our teachers highly engaging tools that inspire students to take ownership of their own learning process.

When kids are given a structured practice mechanism with realistic challenges, clear goals, immediate feedback and the freedom to make mistakes, no one needs to convince them to practice. In the majority of cases, interest, enthusiasm, proficiency, and success are the outcomes.

During the past decade, our political and business leaders have fretted over how to boost our children's maths skills in order to maintain our nation's competitive strength. The response from the established educational community remains focused primarily on "teaching" as the solution to closing the achievement gap.

Instead, shouldn't we be asking ourselves, "Isn't there a better way to learn this complex skill?" All we need to do is look to history to solve the problem. As Edwin Link correctly reasoned in the 20th Century—and as we must once again realize in the 21st—systemised, self-directed practice is the answer to one of our nation's most immediate and important learning challenges.

ROBERT SUN is the CEO of Suntex International and inventor of First In Math, an online program designed for deep practice in mathematics.