Einstein's theory of creativity the wellspring of future genius

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Smart folks are a dime a dozen. What truly matters is creativity. As Albert Einstein put it, "Imagination is more important than knowledge."

Given our focus on science and mathematics, and our emphasis on testing in schools, we need to make sure we don't forget this.

We tend to teach by drilling knowledge rather than stimulating imagination.

Einstein rebelled against rote learning and that attitude helped make him the genius that he was. Likewise, our success as a nation will be determined not just by how well our schools teach the multiplication and periodic tables but by how well they promote imagination and creativity.

The oft-made assertion that Einstein failed maths as a child is, to the disappointment of bad students and those of us who savour irony in history, not true. But he was slow in learning to talk. That was combined with a cheeky rebelliousness towards authority, which led one schoolmaster to send him packing and another to amuse history by declaring that he would never amount to much.

These traits made Einstein the patron saint of distracted schoolchildren everywhere. But they also helped to make him the most creative scientific genius of modern times.

His cocky contempt for authority led him to question received wisdom. And as for his slow verbal development, it led him to think in pictures and to observe with wonder the everyday phenomena that others took for granted.

One evening I was helping my daughter with her maths homework, and I explained that an equation she had produced was clearly wrong because the calculations involved would not result in a line that swooped upward so rapidly. She looked quizzical. I explained that maths was a language that nature used to describe her wonders, and she should try to picture the underlying reality of an equation just as she would do when she encountered a phrase such as Homer's "rosy-fingered dawn". She said she wished she was taught that in school.

Einstein intuitively understood that maths was nature's play book. So, at age 16, he was imagining and picturing Maxwell's equations, which describe electromagnetic waves.

How would these equations be manifest, he wondered, to someone who was riding alongside a light beam? If you caught up, the waves should seem stationary relative to you, but Maxwell's equations didn't allow for that. It worried Einstein mightily for the next 10 years.

His impudence and lack of deference to authority meant that he alienated all of his professors at Zurich Polytechnic. As a result, he was the only graduate in his section who was not offered a junior professorship.

He struggled to find work, finally landing on a stool at the Swiss patent office in Bern as a third-class examiner. But lest we feel sorry for him, the job allowed him to do thought experiments and encouraged him to be sceptical about conventional wisdom, unlike the well-heeled acolytes in the academy.

Among his thought experiments was one in which he imagined two lightning bolts, one striking at each end of a fast-moving train. For someone standing halfway between them on the embankment, they would appear to be simultaneous. But for someone standing halfway between them on the moving train, the strike in front would seem to come first because the observer would be racing closer to it as the light beams travelled from each strike.

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It was a simple insight: two events that appeared simultaneous to one observer would not appear simultaneous to someone moving relative to him. So time itself was not absolute but was relative for people in different states of motion. For a boy racing alongside a light beam, Maxwell's equations would remain the same, but time would slow as he approached the speed of light.

Others had come close to that insight, including Henri Poincare and Hendrik Lorentz. But Einstein had a rebelliousness, a willingness not to conform, that they lacked. He alone was willing to discard the notion of absolute time, which had been a sacred tenet of classical physics for 216 years, ever since Sir Isaac Newton in his *Principia* had declared that it tick-tocked along "without relation to anything external".

"Long live impudence," Einstein proclaimed as a young man. "It's my guardian angel in the world."

If we're going to succeed in training a new generation of Einsteins, we have to be careful to nurture the imagination – even the impudence and rebelliousness – that was the wellspring of his genius.

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