

CURRENT SCIENCE

Volume 114 Number 5

10 March 2018

GUEST EDITORIAL

Aah! Aha! Ha-Ha!: Building a creative nation from the ground up

Think of the untapped potential of millions of poor children who have it in their genes to achieve great things, but fail to do so because they lack the tools to ignite their innate curiosity and express their creativity. Imagine these poor children in a hot and dusty village busy doing experiments and projects, talking and discussing animatedly with their peers and teachers.

A girl demonstrates a model of a simple rocket that she has made, a boy in a wheelchair tells his friend about the properties of magnets, and another girl explains the medicinal properties of a plant that she has grown in the schoolyard. These are possible but difficult to imagine, especially in poor countries, where most schools have no laboratories and where didactic, rote-obsessed learning that discourages inquiry and questioning dominates the school classroom, contributing to high dropout and low attendance rates. 'I can't do it' or 'It's not worth it' seem to be the defining messages engraved in the psyche of millions of underprivileged children and adults condemned to poverty and underachievement.

Are you born creative or is creativity a skill that you can learn? Creative people and problem-solvers demonstrate exceptional skills of questioning, observation, awareness, discovery, association and application, which can be illustrated by a few famous examples:

- Watching a cafeteria plate tossed into the air by a Cornell student, physicist Richard Feynman later derived a two-to-one ratio between the wobble and spin of the plate. The wobbling plate inspired his work on the famous Feynman diagrams and had won him the Nobel Prize in physics.

- In the 3rd century BC, the brilliant Indian statesman Chanakya witnessed a village woman scolding her son for not eating rice. The boy replied that the rice was too hot, whereupon his mother told him to start from the edge of the bowl and eat his way to the centre. The episode propelled Chanakya to conceive the 'rice bowl' stratagem of weakening the enemy's outlying forces before taking the centre, climaxing in the great Mauryan Empire of his protégé Chandragupta.

Such awe-inspiring examples of creativity notwithstanding, the qualities they manifest exist in an active or, more often, unexpressed state in rich and poor alike. Rani and Roja, two village girls from Kuppam, Andhra Pradesh (AP) escaped the sun on a hot summer's day to the welcoming shade of a peepul tree. The girls fell into a

potentially game-changing conversation. Starting with a question, 'why do we feel cool sitting under the shade of a tree?', they wondered if different leaves might have different cooling effects. The question led to a project on the cooling effect of leaves, which won them a prestigious Intel-IRIS science prize at the national level. Rani, who is pursuing an M Sc degree, and Roja had successfully deployed questioning, observing, experimenting, associating and networking to win a coveted prize, skills that a study led by Clayton Christensen of Harvard University says characterizes the most successful entrepreneurs in Silicon Valley. Curiosity, described in *The New York Times* as 'the world's most vital natural resource' and questioning are the foundation of much creative thought and action. A paucity of curiosity astonishingly characterizes much of education and, causally, many professions. According to a US study, 98% of children between 2 and 4 ask questions. This drops to 58% in middle school and 25% in high school. Having witnessed scores of school classrooms in India I would guess the level of questioning by students to be in the low single digits. A child starts as a question mark and ends up as a full stop. 'Answerism', knowing 'the right answer' in the frenetic race for exam grades, has almost completely extinguished the spirit of enquiry and along with it independent thinking and discovery. A similar blissful ignorance of the transformative value of curiosity plagues much of our higher education system.

Indian education needs to change dramatically for India to become a more innovative and productive country. The present rigid education model needs to make way for a more organic and dynamic one. Five fundamental shifts I believe need to occur in our attitude and approach to learning within and outside the formal classroom: from 'yes to why', from 'merely looking to learning to observe', from 'being passive to learning to explore', from 'being textbook-bound, or internet-hooked, to being hands-on' and from 'fear to confidence'. I recall meeting on a hot and dusty afternoon with Uma, a village girl in Kuppam. I asked Uma what impact her experience at the Agastya campus creativity lab had had on her. I expected she might say that she was acing her science tests. She didn't say that, at least not at first. She looked at me and with a gentle smile said, 'I am not afraid to speak any more'. Uma's reply blew me away. Her hands-on experience in science and arts, in teaching other children and in exploring the natural ecology of the campus with teachers

that encouraged her to wonder and question had awakened her self-belief and motivation. Uma aced her tests and became the first girl from her village to join an engineering college. In a wonderful expression of positive herd behaviour, a group of her female friends followed her to college.

Might inspiring examples like Rani, Roja and Uma become the norm rather than the exception? Is it possible for today's low-yielding education systems to trigger the curiosity of millions of children, teachers and communities, and raise the speed limit of creativity of a nation and indeed the world? The fact that creativity is the most desired trait among knowledge workers makes it unquestionably a challenge worth embracing. It is a big challenge, but fortunately an answer rests in the educators' observation that learning, retention and creativity can be enhanced by innovative teaching-learning techniques and strategies. These include linking learning to different contexts, opportunities for students to mix, or interleave, multiple subjects or topics while they study, introducing some difficulty in practice, giving children opportunities to solve problems through projects and theme-based learning involving group activity, reflection and discussion, injecting fun, amazement and emotion into learning, giving children opportunities to teach others and distributed instead of high-stakes massed testing. Creating environments where children and teachers are free to question, observe, tinker, experiment and explore can spark curiosity, nurture creativity and raise confidence. Such insights spell hope for millions of underserved children, teachers and others whose untapped creativity can be ignited through experiential, hands-on and interactive learning methods.

The Romanian sculptor Brancusi remarked, 'Simplicity is complexity resolved'. Experiments and, more broadly, experiences might often benefit from being simple and unexpected. Armed with this insight, it is possible to provide a transformative educational experience in an affordable way to millions by imbuing learning with three wonderfully interrelated, mutually reinforcing essential practices:

- Aah! Using simple, counterintuitive experiments, models and experiences to amaze and awaken the mind and create wonder, delight, curiosity and enthusiasm for learning.
- Aha! Promoting enquiry, experimentation, exploration, discovery and perseverance through kinesthetic, activity- and project-based learning to generate inspiration, comprehension and creative insight.
- Ha-Ha! Relieving fear and anxiety, creating positive emotional connections, improving retention and performance, and increasing motivation and joy in learning through fun and immersion.

Mounika, a village girl, was an underperformer at school and destined for an early marriage. She was persuaded to visit the Agastya campus where the teacher asked her to show him her finger, which he pricked to extract a drop of blood (Aah!) and revealed to Mounika her blood group. As Mounika recounts, 'This changed my world. I

had no idea about blood groups. I realized that there's a whole world of knowledge that I needed to be a part of (Aha!)'. Mounika's grades shot up, she came first in her class, and her father relented and sent her to university (Ha-Ha!), where she earned a B Sc degree.

Mounika's story underscores the power of igniting moments, which eminent scientists like C. N. R. Rao and R. A. Mashelkar, as well as achievers in many walks of life, have attributed to sparking their aspiration and imagination and setting them on the road to success. How might education systems create more igniting moments at scale? Starting early in a child's education, low-cost science and arts kits, make-your-own-labs, and well-designed and interesting, even counterintuitive, experiments, activities and projects can engage children and teachers to explore, experiment, build and create. Integration of the arts in science, and conversely, can be a great spur to creativity. Peer-to-peer learning, where children teach other children can have a transformative effect on a child's self-belief and ability to discover collaboratively with others. Design thinking, which promotes problem-finding, idea generation, empathy, teamwork and creative problem-solving weaved into science, humanities and arts education can have a prodigious impact on a child's future and destiny. None of them requires a costly investment in physical assets.

'Train a teacher to educate a school' is a panacea invoked to transform education. Unfortunately, many teacher-training programmes trapped in inorganic models have failed to ignite teacher motivation and positive changes in the classroom. Lest one despair, teachers in many ways are no different from children. 'Today, we can't afford to become adults', says MIT's Joichi Ito. The secret to impactful teacher training lies in creating a neonous environment that takes teachers back to their childhood – an environment that stimulates new and unexpected experiences (Aah!) and promotes tinkering, experimentation and knowledge (Aha!) and playfulness (Ha-Ha!). Teachers should be encouraged to construct knowledge and make learning come alive in the classroom. Like the symbiosis between a medical college and hospital, teacher training should incorporate live and interactive learning with children.

It takes creative builders to build a creative nation. Borrowing from nature, fertile soil absorbs rainfall to produce a rich ecosystem. The fertile ground of creative minds likewise absorbs and transforms information, knowledge and capital to make a society innovative, productive and prosperous. By creating environments that spark curiosity, spur creativity and spread problem-solving and leadership skills we can raise the fertility and self-belief of millions of minds to build an innovative and creative society that lives and breathes the magic of Aah! Aha! Ha-Ha!

Ramji Raghavan

Agastya International Foundation,
12 Jayamahar Main Road,
Bengaluru 560 046, India
e-mail: ramji.raghavan@agastya.org