



THE SCIENTIST OF THE FUTURE

A special issue of Nature examines what is needed to grow the next generation of scientists.



What does it take to be a successful scientist in the modern world? The obvious answers are deep knowledge of a discipline and mastery of the scientific method. But there are other key requirements, such as the ability to think critically and solve problems creatively and collaboratively. Communication skills are a must, and mastery of modern technology helps.

ILLUSTRATION BY YASAVA

For generations, classes in science, technology, engineering and maths (STEM) have been focused almost exclusively on building knowledge alone. A steady diet of lecture-based learning was designed to fill students up with facts and test their ability to memorize them. Teaching the other skills was too often given short shrift.

Now educators and education researchers are calling for change. They argue that creative thinking, problem solving, motivation, persistence and other 'twenty-first-century skills' can, and should, be taught and fostered through well-designed courses. Developing these skills enhances students' abilities to master and retain knowledge; many hope that focusing on them will help to curb the alarming rate at which students interested in STEM abandon the subjects. The Organisation for Economic Co-operation and Development deems STEM education as crucial to powering innovation and economic growth, and has strongly encouraged investment in education strategies that focus on twenty-first-century skills.

Now *Nature*, in collaboration with *Scientific American*, is taking a look at the challenges in STEM education (a full listing of content is available at nature.com/stem). A News Feature on page 272 discusses the move towards 'active learning' rather than passive lecturing in the undergraduate classroom, but finds that encouraging innovative methods requires a change in incentives. A Comment article by representatives of the Association of American Universities and the Research Corporation for Science Advancement Cottrell Scholars on page 282 offers a road map for the institutional changes that will be required to shift the status quo.

Those teaching science in primary and secondary schools face different constraints, but have no shortage of innovative practices. A News Feature on page 276 looks at some of the most creative STEM education programmes around the world, for preschoolers up to teens. On page 286, leading design practitioners explain how nature itself aids early child development, and how architecture and play spaces are best engineered for learning. At the other end of the spectrum, senior researchers should brush up their leadership skills, says a Comment piece on page 279.

Finally, *Nature* polled some of the leading thinkers in science and education for what it takes to make an effective scientist in the twenty-first century. With answers on page 371 that range from the practical to the philosophical, it is clear that the science classroom is in for a radical change. ■