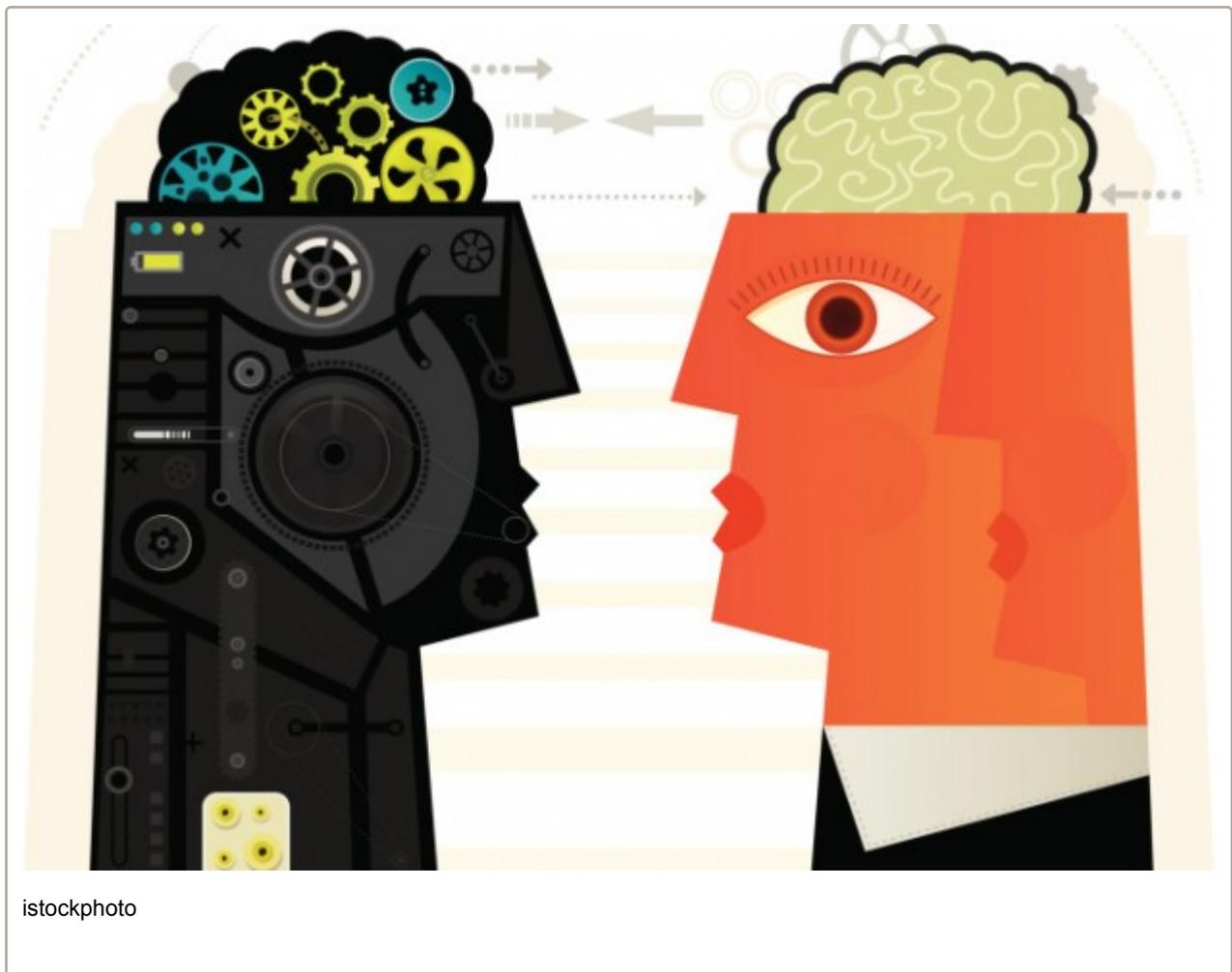


If Robots Will Run the World, What Should Students Learn?

By Katrina Schwartz

- [CREATIVITY](#)

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Education reformers have been [calling for a different type of education](#), one that nurtures creative and innovative thinkers. But for many, that future is hard to see and even harder to influence.

Science fiction writers and blockbuster movies have been predicting a world run by robots for decades, and for most of us, the fantasy has stayed in the realm of fiction. But artificial intelligence has [made rapid progress](#) and robots are becoming more a part of everyday life than many people realize. Those who study robots and their impact on life foresee a day not too far off when many jobs now held by people will be automated.

“If you can detect a pattern, you can automate it,” said [Charles Fadel](#), founder of the Center for Curriculum Redesign and a visiting practitioner at Harvard’s Graduate School of Education, who spoke at the recent [Learning and the Brain Conference](#). Fadel sees signs that robots are already becoming a part of everyday life. Google has a self-driving car. Japan recently put on [a concert](#), attended by thousands of people, featuring a hologram popstar with a synthesized voice. [Virtual models](#) are gradually being put to work displaying the newest styles, and [Watson the supercomputer whooped-on the best Jeopardy players](#). Signs of robotic intelligence are everywhere and educators need to be preparing students to enter a dramatically different world, Fadel said.

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As artificial intelligence improves and slowly takes over aspects of daily life, the only way for people to continue to be useful is to “up-skill” — and that takes creativity. “Incremental creativity is just improving on something, but radical creativity is thinking something up,” Fadel said. He believes that, in time, computers will be capable of incremental creativity, slowly improving a process and building on its success. What they will never be able to do is generate a radically new idea.

“We’re being pushed upwards in abstraction, in some senses,” Fadel said. Recognizing how sophisticated computers already are, and how much better the algorithms are getting will be important as the education system evolves. Implicit in Fadel’s stark view of how artificial intelligence fits into human kind’s future is a question about the value of education. Why teach content when everything is searchable? Why teach specific skills when computers will one day be able to do that work, he asks.

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Education has to focus on learning *how* to learn – metacognition. School will still be important, but not to impart what happened during the Revolutionary War or to teach the quadratic formula. School, he said, should focus on teaching young people the intangibles, the things that make humans unique: relationships, flexibility, humanity, how to make discriminating decisions, resilience, innovation, adaptability, wisdom, ethics,

curiosity, how to ask good questions, synthesizing and integrating information, and of course, creating.

In the future, computers and humans will be working together to create the next big invention and when that happens, people can distinguish themselves by controlling the process and the strategy. Humans will define the goals and will think creatively about solutions.

But to get to that place, the education system needs to nurture creative young people. That isn't happening right now, he says.

EDUCATORS CAN HELP

Most political leaders and education experts agree that the education system needs to adapt to the technological realities of the age and work to produce more creative thinkers. "The whole culture is coming out with support for more and greater creativity in students," said [R. Keith Sawyer](#), professor of education and psychology studying creativity and learning at Washington University in St. Louis, at the same conference.

Sawyer says fostering creativity starts by recognizing that it's a collaborative process, not one big idea from a genius. Rather, it's more like improvisational theater. "Each person contributes a small idea or contribution and the next person picks it up and takes it somewhere," Sawyer said. "It's unpredictable and unplanned but something wonderful emerges."

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Recognizing that much of the creative work generated comes out of collaborative group work, teachers can think about their classrooms as places for improvisational flow, where teachers and students are building knowledge together. Structure is needed, but some flexibility as well.

"The role of the educator is to channel and guide what is fundamentally an improvisational process," Sawyer said. "Students learn what they need to learn but in a way that allows them to be creative."

To arrive at an improvisational classroom, educators can [move away from an instructional model](#) for the classroom. The traditional model clings to the notion that children need to learn particular facts and it's the teacher's job to impart that information to students. Facts

and information build incrementally and turn into more complex ideas, and learning is measured by testing knowledge of facts.

But many argue that this model results in superficial knowledge and low retention, weak transfer to new situations, inability to integrate facts and apply to other situations, Sawyer said.

Sawyer proposes that schooling should be constructionist, focusing on a deeper, conceptual understanding of topics with the [ability to build new knowledge in new situations](#). To do this, students need to take facts, skills, and concepts and apply them to real-world problems. Learning should start with a driving question. This way, students can explore the topic through inquiry and discussion, working in teams, just as they would in the workplace or other life situations. Students create a tangible product that addresses the issue at hand, and along the way an instructor guides the process.

Sawyer is not naïve about the challenges to this model. It's hard to develop a good design question. "The really good problems are not too hard, not too easy and they result in the acquisition of required content," Sawyer said. But even after coming up with a perfect problem, it's difficult to get students to actively engage and to collaborate effectively. It's hard to assess learning this way and to effectively critique in a way that doesn't stunt ideas, but helps guide the process.

It may seem daunting to change the current system into something that resembles the constructionist model Sawyer and others champion. But Sawyer said it's happening in schools across the country, and educators are passing along these ideas to each other.

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"Every teacher is a creative professional," Sawyer said. "And in the ideal world, every teacher is contributing these small ideas, engaging in mutual tinkering. But we have to share with others, we can't keep it in the classroom." The creative act of teaching needs to be a collaborative one, like a startup team working on the next innovative product. If each teacher continues to tinker and offer ideas to the larger group, a creative breakthrough will emerge.

"It's going to be every one of us that contributes ideas along the way," Sawyer said. And in doing so, teachers everywhere can create the institutional change that stands between them and implementing the ideas that to many are obvious and instinctual.