

Comments on the Future of K-12 Education

**by
Jay W. Forrester**

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Working in K-12 education to develop Systems Citizens

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Jay W. Forrester
80 Deaconess Road, Suite 442
Concord, MA 01742-4173

tel: 978-369-9372
fax: 978-369-9372
email: jforestr@mit.edu

January 5, 2011

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Today's schools were designed long ago to meet the needs of a dawning industrial society. They prepared students to be productive workers in the factory system, and schools themselves were fashioned on the principles of mass production – efficient assembly lines for uniform products.

Now times have changed. Students need a much broader set of skills to be effective in problem solving, teamwork, clear communication and continuous learning. Our goal is to give students and adults a far deeper understanding of how social, economic, and physical systems operate and how to improve their behavior.

There is a fundamentally different kind of pre-college education that I, along with many others, have been pioneering for more than twenty years. The demonstration phase is now completed and it is time to launch a major implementation program to expand into a growing number of schools. This is a long-range and difficult undertaking but necessary if K-12 schools are to produce citizens who are prepared for the challenges of the future

Many people have expressed disappointment with performance of the present K-12 schools. A publication from the National Academy of Engineering observed, "... another \$650 billion has been spent on US public schools while the performance of its students on standardized science tests of those about to graduate declined further." But who is answering the question of why results have declined further? I believe that we have here a syndrome that we often identify in corporations through system dynamics modeling--the steps that people are taking in the belief they will solve a problem are actually the causes of that problem, and the more they do in an attempt to remedy a situation the worse they make it.

The intensive emphasis on science and mathematics and the pressures of

the "No Child Left Behind" movement are driving education in the wrong direction. Because of the emphasis on school-wide test averages, there is an implied assumption that we want all children to be alike, and that certainly is not desirable. There is pressure on schools and classrooms to raise the average on test scores; but to raise the average, a disproportionate fraction of effort must be devoted to the less able students to the detriment of helping the best students reach new heights. Worst of all, students are expected to learn under the whip of raising test scores to improve the status of teachers and the financial success of the schools, rather than for the love and excitement of learning and for individual personal development.

Many critics lament the lack of innovation in our society, and draw the conclusion that more emphasis on mathematics and science will lead to innovation. However, pressures in present school systems suppress innovation. Innovation comes from repeated successes in innovating.

Innovating means trying ideas outside of the accepted pattern. It means the opportunity to fail as a learning experience rather than as an embarrassment. It means living part of the time outside of the traditionally accepted track. An innovative spirit requires years for developing the courage to be different and calibrating oneself in identifying the effective region for innovation that lies between the mundane and the impossible.

Almost none of the conditions for developing innovative attitudes are to be found in the usual K-12 education. In fact, the traditional school powerfully suppresses any tendency toward being innovative. Both teachers and students are driven to conform.

An experimental development of a new kind of K-12 education has been gaining momentum at the grass-roots level for some three decades. It is based on the field of system dynamics that was launched at MIT beginning in 1956.

System dynamics deals with how things change through time, which covers most of human concerns. System dynamics uses computer simulation modeling to reveal how the structure and policies in a system act to create its behavior. It has been demonstrated that simulation of complex systems is within the grasp of elementary school students.

System dynamics has spread very widely but still thinly into many fields

and professions. As for myself, I see system dynamics as a foundation under most aspects of a future K-12 education and that this is our most important frontier.

I am suggesting several documents that should explain more completely the opportunity that lies ahead. One, "D-4893, Quotations from K-12 Teachers" gives a feeling for some classroom vignettes. Every two years we have a conference of teachers who are pioneering this systems approach; some 100 to 200 attend. Teachers say to me comments such as, "I had no idea that these students could do so much."

More than 20 years in the pioneering, experimental, and demonstration phase have now been completed, I am undertaking to find some \$100 million for the next 10-year phase that will be active expansion.

I believe that we do not want government money, rather private funding from individuals who see this as a way to make a major improvement for the future. Government funding has two serious disadvantages--it is usually short-range funding that will not connect with a ten-year objective; also, substantial government funds will draw in many applicants who are entirely lacking in the correct vision, competence and attitudes for success in what has already been demonstrated.

This is a long-term effort, but the short-term attempts to improve schools have been demonstrated as mostly ineffective. If we do not start a fundamental change, it will never happen.

We hope to find more people who will participate in this educational frontier.

I will appreciate reactions, comments and advice, after reading the suggested documents.

Suggested reading:

D-4893, System Dynamics: The Classroom Experience, Quotations from K-12 Teachers

D-4894, Some Basic Concepts in System Dynamics

D-4895-1, Learning through System Dynamics as Preparation for the 21st Century

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