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## How thinking like an engineer can help school reform

By Valerie Strauss, Updated: November 30 at 10:00 am

Arthur H. Camins, director of the Center for Innovation in Engineering and Science Education at Stevens Institute of Technology in Hoboken, N.J., suggests a new way to make progress in education policy — through engineering design thinking. The ideas expressed in this article are his alone and do not represent Stevens Institute. His other writing can be found at [www.arthurcamins.com](http://www.arthurcamins.com)

By Arthur H. Camins

Arguments in a democracy are natural and could be healthy, but I worry we are not making much progress when it comes to current education policy. A dose of engineering design thinking can help.

An essential step in such thinking is defining and delimiting the problems. Three central problems plague public education the United States. The most dramatic is inequity. There are vast inequities in educational resources and in the conditions of students' lives, resulting in persistent race- and class-based disparities in educational outcomes. Second, we are far too focused on a narrow range of outcomes — reading and math test scores — and not enough on a broader range of subject matter or essential domains, such as critical thinking, creativity and collaborative skills. Third, we gravitate toward partial quick solutions, rather than thinking systemically and having the patience allow strategies time to develop, take hold and be refined.

Next, we need to consider both values and technical constraints for ideal solutions. For example, we need to ask what mix of collaborative and competitive strategies align with our values and research on systems that have been successful in sustaining significant educational improvement.

In addition, since ideal solutions always prove better in theory than in practice, we need to plan for optimization— repeated cycles of testing, redesign and retesting.

Finally, to make progress we need mobilize the necessary political will. To do so, we need to hear more about common sense, high-leverage solutions— framed as messages that respect people's intelligence and tap into their values, aspirations and sense of fairness.

I offer some ideas for these messages below:

*Parents' wealth, their educational level, or where they live should not determine their children's life chances, so:*

- Governments should actively promote integrated classrooms because that is where students learn most effectively and where they are best prepared to live and work in an increasingly diverse, interconnected world;
- Federal and State funding for public education should make up for differences in communities' wealth to ensure quality and equity in resources for all;
- Universal, free, developmentally appropriate pre-school and other supports for children and their families, such as ensuring adequate housing, nutrition and health care should help make up for vast differences in students' life chances so that all can arrive in kindergarten ready to learn.

*Every child has a right to an effective teacher in a well-organized school, so like in other professions:*

- Teachers should have extensive training and supervised apprenticeship periods so that they arrive in classrooms with significant expertise;
- Teacher should have consistent opportunities to learn from colleagues and experts so that their expertise continues to grow.
- The way to attract and retain the best teacher candidates is to provide competitive salaries, opportunities for growth and advancement, good working conditions and public respect.
- School systems and state and federal education departments are best led by people with deep knowledge and experience about learning and leading complex organizational improvement.

*Schools should prepare students to succeed as workers, community and family members and citizens in a rapidly changing world that we cannot yet fully imagine, so:*

- Students should be taught to be thinkers, problem solvers, team members and life long learners.
- Students should be become proficient in reading and mathematics, but also in science, social studies, creative arts and sufficient opportunities for physical education.
- Students' social and emotional well-being should be supported in order to advance their learning and development.
- Students should learn that success and intelligence are advanced by hard work and persistence on challenging tasks.

We need to build a movement for what we *do* want for our children.

These suggestions for ways to talk about how to ensure the highest quality education and equity stand on the shoulders teachers and administrators, scholars and researchers,

parents and community activists who have struggled for decades. It is time for these voices to be heard.

Educational equity has long been our unrealized national aspiration. I am reminded of Langston Hughes poem, *A Dream Deferred*.

*What happens to a dream deferred?*

*Does it dry up  
like a raisin in the sun?  
Or fester like a sore—  
And then run?*

*Does it stink like rotten meat?  
Or crust and sugar over—  
like a syrupy sweet?*

*Maybe it just sags  
like a heavy load.*

*Or does it explode?*

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