Overcoming System Inertia in Education Reform

Maya Bialik, Charles Fadel
February 2017
# Table of Contents

- Introduction .................................................................................. 1
- Mechanisms of Systemic Inertia ..................................................... 1
  - College Entrance Requirements .............................................. 2
  - Politics ...................................................................................... 2
  - Limits of Assessments ................................................................ 3
  - Experts ..................................................................................... 3
  - Consensus .................................................................................. 4
  - Teachers .................................................................................... 5
  - Parents ...................................................................................... 5
- Misunderstanding Understanding .................................................... 5
- Conclusion .................................................................................... 8
- About the Center for Curriculum Redesign ..................................... 9
  - Knowledge, Skills, Character, and Meta-Learning ....................... 9
INTRODUCTION

All systems persist in part because their elements continue to perpetuate them. Education systems are no different, making large-scale reform extremely difficult, despite the acknowledged urgency of such change. Like a supertanker, the education system is large and powerful, but requires a correspondingly large amount of force to change its direction.

One of the main obstacles in changing the goals, standards, and curricula of education is historical inertia. Even as we re-awaken to the importance of a variety of competencies and knowledge areas beyond the outdated curriculum, it is difficult to effectively insert new subjects, skills and character education into an already established and content-crowded system. Ambitiously incremental, let alone radical, innovation becomes nearly impossible under such constraints. In most cases, new goals and content additions are tacked onto an already overburdened curriculum, and with the pressure of preparing for standardized tests, relatively few educators are able to consistently provide the time needed to effectively integrate new learning goals into the curriculum.

This paper will examine the motivational and cognitive mechanisms that contribute to the inertia of education systems.

MECHANISMS OF SYSTEMIC INERTIA

“There is nothing... more dangerous to manage than a new system. For the initiator has the enmity of all who would profit by the preservation of the old institution and merely lukewarm defenders in those who gain by the new ones.”

-- Niccolo Machiavelli, The Prince

The education system serves a very specific role in society: it is meant to instill in future citizens the necessary knowledge and competencies they will need to lead fulfilling lives and contribute to society in a meaningful way. This placement of school as mandatory preparation for more schooling, work, and life imposes particular constraints and incentives on what the outcomes ought to be (see Figure 1).

![Figure 1: The Role of Education in relation to Work and Life and their various requirements](Source: CCR)

College Entrance Requirements

In order for education systems to effectively feed into higher education institutions, they must ensure alignment between the place where one finishes and the other starts. For example, Algebra and Calculus are often considered the most important parts of of a High School mathematics education, the starting point of university maths, and often discussed as indicative of the ability to succeed in college - a litmus test of sorts. The particular concepts and processes that are covered must also be to some degree aligned, so students are prepared to transition and continue their learning. This is important to the continued functioning of education, however, there can be some unintended side effects. Taking algebra as an example, while it is helpful for the 28% of bachelor’s degree students who enter college with a STEM major and are expected to take Calculus, what is the experience of the other 72%? Further, what is the experience of the 32% of high school graduates who do not enroll in college? Although the requirements are often serving a minority of students, it is difficult to change them because of the fear that it may disrupt
a delicate balance that is necessary for an important minority.

College entrance requirements also serve the universities, in that they are a sorting mechanism to organize applicants. Tests such as the SAT and ACT in the USA are useful because they are standardized; they allow for a statistically valid way to compare students’ scores directly, while high school GPA is highly variable depending on the quality of the high school and the particular experiences of the students and their teachers. In order to be statistically valid, these standardized tests must be structured in a relatively narrow way, compared to the broader potential outcomes of education. The content only matters insofar as it can be standardized and can be expected of all students graduating high school. While a useful tool for colleges trying to sort applicants, these assessments can have large impacts on what and how students are taught in school, narrowing scope to traditional subjects and focus on skills necessary to take a multi-hour intensive multiple choice test.

Although screening mechanisms may continue to be necessary, they need to be revised and re-conceptualized as a small part of the goals of primary and secondary education. The goals of Education should not be narrowed down to college entrance requirements.

Politics

At the policy level, most countries must work with an inherent level of instability, with elections and changes of leadership occurring every few years. The frequent changes of personnel (at both the staff level and the ministerial level), and the political pressures to balance the competing interests of voters, parents, unions, businesses, and so on, often preclude the continuity necessary to reflect on large-scale trends, plan for long-term goals, take calculated risks, or embrace change and innovation. The pressure of re-election de-incentivises politicians from making large changes, as this may cost them their job. Further, the systemic shifts between conservatism and progressivism make long-term change difficult, as any changes can be negated in the following cycle, before the results of the change can be appraised.

Limits of Assessments

Although the SAT began in 1926, the modern focus on assessment outside of an admissions context (to be used for student and teacher improvement or program evaluation) can be traced back to the 1960s. It began with several focuses: learning in college and its role “adding value” and as a return on investment for society, retention and student behavior, program evaluation, and mastery learning across school and corporate contexts. These varying contributing perspectives set up the tensions that still exist today: between quantitative and qualitative methods, accountability and improvement aggregate vs. individual performance, and its relation to teaching and learning. As these lines of research merged with a greater emphasis on accountability for political reasons, standardized assessments became mainstream in the 1990’s; the First National Conference on Assessment in Higher Education was held in Columbia, SC in the fall of 1985. The science of assessment is still relatively new and incomplete, and its fundamental tensions have not been resolved, but have faded into the background assumptions. Limits of this research, particularly for things like skills and character qualities, act as constraints on progress in reform.

Assessment has neither disappeared as an unsuccessful movement, nor has it been integrated into the values and functioning of education. It remains as an add-on, on top of traditional academic activities, and enforced by outside pressures. The lack of integration limits the amount that assessment can be useful in transforming education practice.

Experts

At the level of human expertise and authority, decisions are often reserved for subject-matter experts. These experts’ opinions are partial and biased in certain predictable ways. First, experts feel
responsible for upholding earlier standards, as they have sometimes been part of creating them and promoting their benefits. Being loyal to their field of study, they also find it difficult to discard parts of the whole cloth of their field’s knowledge, even as those parts become less useful.

Second, the experts are often hyper-focused on their branch of their discipline, making them liable to “miss the forest for the trees”. The greater one’s expertise, the more they can be narrowly focused, even missing the tree for the bark. As a result they may effectively ignore the whole tree of say, mathematics - they are merely defending trigonometry or at best geometry, and they’re certainly not looking at the impact of mathematics on the rest of the tree species in the forest (the other disciplines) nor at the ecosystem supported by the forests (math in the real world). Even teachers fall in the same trap of overemphasizing the importance of their discipline or branch over others due to their personal focus on it. This makes giving complete control of standards to teachers’ unions or academic experts a recipe for inertia.

Third, it is very difficult for experts to add new disciplines to traditional fields of knowledge. For example, algorithmics and game theory are topics that are relevant for current advancements in a variety of fields that use mathematics, but tradition-oriented mathematics experts do not include them in their efforts to reform mathematics curriculum. Additionally, expert academics often operate in relative isolation from the demands of the real world, sometimes unaware of the ways their discipline is currently being applied in professional settings outside academia.

**Consensus**

Subject-matter experts as well as education reform experts place a large emphasis on the ways others in their field around the world are accomplishing similar curriculum reviews, and to conform to international comparisons like TIMSS and PISA. In trying to adjust, they are subject to groupthink, and thus are rarely able to be highly innovative. Ideas that are too far outside what is currently acceptable do not get support and the result of attempting to achieve consensus is a regression toward the mean.

The second major problem in achieving consensus in curricular reform is the terminology. Because the goals of education are so broad and rich, there are many equally valid ways of organizing them, making it difficult to make progress. The table below shows CCR’s Four Dimensional framework side by side with five other leading frameworks. Although they all cover the same general ideas, they all describe them in slightly different ways. The cross-walk below offers a cursory birds-eye-view of the requirements side by side, though it of course cannot capture the deeper differences in concepts and meanings (see Table 1)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>Subject-based skills</td>
<td>Communication in foreign languages Mathematics, Science, &amp; Technology Digital competence Entrepreneurship</td>
<td>Academic content</td>
<td>Mathematics, Science Language–English Languages–World Economics, Geography, History, Government &amp; Civics, and Arts Information Literacy Media Literacy, ICT Literacy</td>
<td>Information Literacy ICT Literacy</td>
</tr>
<tr>
<td>Skills</td>
<td>Skills in thinking and creativity</td>
<td>Communication in the mother tongue</td>
<td>Think critically and solve complex problems Work collaboratively</td>
<td>Creativity Critical Thinking</td>
<td>Creativity and innovation Critical thinking, problem solving, and decision</td>
</tr>
</tbody>
</table>

**Table 1:** Cross-walk of CCR’s Four Dimensional framework with other frameworks.
Teachers are often the ones who must carry out changes in education, yet they are rarely included in the discourse. As a result, programs are often imposed on them from "on high", and without proper training teachers are not able to implement them successfully. This not only results in the failure of programs with promise, but is disheartening for teachers. It is crucial to remember that ultimately, no matter the program, reform happens through people, not policies, curricula, or technology. Changing teachers’ subject matter understanding and approach to teaching requires thoughtful and deliberate planning and training, with consistency of purpose and implementation. It must not only tell teachers what they should do, but make sure they have internalized the necessary changes in their conceptual frameworks, beliefs, and attitudes about teaching and the subject matter. Teachers must be taught the new material as learners themselves.

Parents

The role of parents is often overlooked in discussions of education reform, as they are the hidden part of the system, less visible than policymakers, administrators, teachers, and students. But their involvement cannot be understated. After all, parents are the public, and their experience of the education system through their children’s experiences forms the basis of their opinions and attitudes. If reform efforts ignore and disempower parents, excluding them from the discourse, attempted changes will not be successful in the long term as they quickly fall out of positive public opinion.

---

MISUNDERSTANDING
UNDERSTANDING

“Essentially, all models are wrong, but some are useful.”
- George Box

The previous section briefly discussed the limits of the relatively new science of assessment. This section explores the more general problems with the application of social science research.

The human endeavor of social science research is based on the goal of building understanding to ultimately make better choices. In education this is captured in the terms “data-driven” and “evidence-based” reform. In Figure 2, these two terms are plotted based on their frequency of appearance in books from 1955 to 2000; it is clear that beginning with the 1970’s, and in particular in the mid-90’s, this is has become very important.

![Figure 2: Frequency of “data-driven” (blue) and “evidence-based” (red) in books over time. Source: Google n-gram.](image)

But what exactly does it mean to take a term like “data” out of the realm of science and apply it to something like education reform? In much of science, the process of knowledge generation has been highly separate from the application of that knowledge to decisions. But as scientific thinking begins to tackle human and societal questions, science has gotten closer and closer to the decisions downstream of it.

This challenges the categories that have been set...
up to cleanly separate understanding and acting. and the simplification, which held for cleaner divisions, begins to break down, calling into question both processes. Science has been pushed to take into account constraints and questions from society, and society has been pushed to make its decisions based more and more on science. This is both good and bad. It is good to be mindful of the relationship between the two, and use insights from each to inform the other. But the downside is evident when the goals, limitations, assumptions, and mindsets of one bleed into the discussions of the other. For science, it can cause the erosion of crisply defined ideas as well as tightly controlled and cleverly designed experiments; for society, it can create a fragile understanding of what knowledge is, and how to deal with uncertainty.

This misunderstanding of understanding is critical to untangling the role of evidence in policy. In the postmodern world, with the democratization of research, writing, and dissemination, it has become clear that data can be massaged, facts can be cherry-picked, and statistics can be bent to fit almost any argument. The social sciences are undergoing a replicability crisis\(^2\), and discussions of Open Science and the Science of Science are growing. At the same time, the authority of science in the views of non-scientists has increased; it has become common to refer to science as a monolithic entity, which is able to “prove” or “disprove” certain “facts”.

This creates a fragile system. The public holds science in reasonably high regard, but expects its findings to be rock-solid knowledge. This means that in order to completely discount a statement purportedly backed by “science”, all one needs to do is find a counterexample, or show a flaw in the reasoning, and the entire trust that has been naively placed on this fact collapses. At the same time, if one has an attachment to a particular claim, one is able to hold on to it and even more deeply entrench that belief in the face of challenges, because of the intuitive postmodern understanding that evidence can be found to support anything. Selective attention and confirmation bias become powerful tools of those who stand to benefit from a particular side of a discussion. The result is debates in which neither side is able to hear its opponents’ arguments. They are able to continue to believe their own opinion and easily refute the other side, by showing miniscule examples of incompleteness in their reasoning.

Knowledge is not the accumulation of facts, but the slow, gradual updating of paradigms and eliminating of theories. This is one reason academic writing is so obscure: the focus is not on proving large arguments to be true, but on eliminating and proposing explanations at a scale so small that it can be tested by future experiments. Only over long stretches of time does this work get synthesized into “Knowledge” and presented as fact in Science textbooks. But this is how people are first exposed to science, and the tone – that science knows beyond a doubt that this is how the world works – remains into adulthood, unless one goes on to become a researcher and learns the nuances firsthand.

It is difficult to internalize the true nuances of the scientific process, that at any given point on any given topic, there is a body of research that has been synthesized and is established knowledge, another body of research that is in the realm of reasonable hypotheses, and finally there are claims that are simply unwarranted assertions.\(^3\) From the outside, all of these claims may sound the same, and this lack of nuance can be exploited; those who stand to benefit can paint established knowledge as reasonable hypotheses that warrant a debate and have a legitimate

---


“other side,” or frame reasonable hypotheses as unwarranted assertions by emphasizing the points against them.

The result is that when there is a new idea that challenges the status quo, those that support (stand to gain from) the incumbent position are able to easily “disprove” the challenging idea, and push forward the incumbent idea. ⁴ The burden of proof lies by default with the challenging idea, rather than with the incumbent idea, despite the current paradigm never truly defending itself to the same standards as those it imposes on new ideas, and its lack of effectiveness at achieving the goals of education. The world spends approximately $2 Trillion per year on education, and seems unable to successfully respond to the needs of society (global warming, employability etc.). One unanswered question is, “why should the challengers be the only ones to be forced to justify themselves?”

**CONCLUSION**

Successful implementation of modern education goals will hinge on two critical factors that address all these challenges. At the policy level, we will need to strive toward a stable consensus among political factions, and a clearly articulated vision of the kind of education students now need. At the level of disciplinary experts, there needs to be continuous involvement of real-world users of the disciplines, in addition to reform-minded academics. Parents and teachers will need to be included and empowered in the paradigm shift. A nuanced view of knowledge and science will need to be the foundation for a more accurate discussion of evidence.

---

⁴ Sometimes, the social attitude is one of dissatisfaction, and a new idea is able to win, but it is just as easy to disprove with the next challenging idea, and the result is a series of fads which do not have enough time to be implemented properly or to take root in the community, and which burn out teachers by forcing them to revamp their teaching methods every few years.

We will need to carefully re-examine the relevance of what we teach, curate the traditional disciplines, add relevant modern disciplines and interconnections, and place emphasis on more holistic learning — moving beyond knowledge and into competencies: skills, character, and meta-learning. We will need to leverage best practices from education systems around the world (and from industry where applicable). Finally, we will need the courage to innovate, letting go of the comfort of an existing system and working under conditions of uncertainty toward a better one.

**ABOUT THE CENTER FOR CURRICULUM REDESIGN**

In the 21st century, humanity is facing severe difficulties at the societal, economic, and personal levels. Societally, we are struggling with greed manifested in financial instability, climate change, and personal privacy invasions, and with intolerance manifested in religious fundamentalism, racial crises, and political absolutism. Economically, globalization and innovation are rapidly changing our paradigms of business. On a personal level we are struggling with finding fulfilling employment opportunities and achieving happiness. Technology’s exponential growth is rapidly compounding the problems via automation and offshoring, which are producing social disruptions. Educational progress is falling behind the curve of technological progress, as it did during the Industrial Revolution, resulting in social pain.

The Center for Curriculum Redesign addresses the fundamental question of “WHAT should students learn for the 21st century?” and openly propagates its recommendations and frameworks on a worldwide basis. The CCR brings together non-governmental organizations, jurisdictions, academic institutions, corporations, and non-profit organizations including foundations.
Knowledge, Skills, Character, and Meta-Learning

CCR seeks a holistic approach to deeply redesigning the curriculum, by offering a complete framework across the four dimensions of an education: knowledge, skills, character, and meta-learning. Knowledge must strike a better balance between traditional and modern subjects, as well as interdisciplinarity. Skills relate to the use of knowledge, and engage in a feedback loop with knowledge. Character qualities describe how one engages with, and behaves in, the world. Meta-Learning fosters the process of self-reflection and learning how to learn, as well as the building of the other three dimensions.

**Figure 3:** The CCR Four-Dimensional Framework

**Source:** CCR
Please continue the conversation and join our mailing list at www.curriculumredesign.org/subscribe