Addressing educations’ most intractable problems

A case of failing schools

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Abstract

Education’s most intractable, perennial problems go unresolved not because policy makers and teachers lack the will to address them but because the challenges result from the interconnectedness and complexities of education, creating social problems seemingly beyond reach for systemic, sustained solutions to be attempted. The purpose of this paper is to examine and apply a Futures Inquiry approach and rethink the challenges of school reform from a complex adaptive systems perspective to address the case of perennially low performing schools. The Futures Inquiry approach is a multidimensional approach to deconstructing educational issues that takes advantage of patterned solutions without artificially over-simplifying or prematurely reducing problems while also keeping in mind creating sustainable, adaptive educational futures. This approach is particularly valuable as a solution-pathway during times of rapid change, reduced resources, and social upheaval. The Futures Inquiry approach presented herein is essential for addressing the challenges of systemic educational inequalities to ensure full participation of all of our future citizens in a rapidly changing, global society. Futures Inquiry as a problem-solving tool, provides the basis for transforming education as a fundamental social institution.

The problem of failing schools: In search of a silver bullet

US Secretary of Education, Arnie Duncan, described education as the “civil rights movement” of the 21st century¹, suggesting that a sound education for all of our children is the most important social, political, and economic challenge we are facing today. Embedded in this claim are the challenges of educational disparities that still exist fifty years after passage of the first Elementary and Secondary Education Act (ESEA) (1965) designed to address educational inequities and poverty². The first and subsequent versions of the ESEA define the United States Federal Government’s role in establishing policy priorities for education to address large-scale social issues. Subsequent reauthorizations of the ESEA have continued to introduce strategies to address educational challenges. Policies and practices introduced during the Reagan era initiated a Back to Basics movement in the 1980’s followed by the No Child Left Behind act (NCLB, 2001) signed into law by President George W. Bush with new testing mandates for states. With NCLB, differences in student performance on standardized tests became the focus of school reform efforts, birthing an entire education non-profit industry as purveyors of solution pathways for addressing poor student performance. Whether a subversive attempt to dismantle public education, or an attempt to address the challenges of educational inequities, competition and its underlying idea of survival of the fittest were introduced in the late 1980’s as a public good so education innovation³ would occur and became part of the policy environment for public schools.

Policies enacted to address educational disparities as defined by NCLB tracked school performance as a function of student achievement scores on tests. Because some schools had consistently low student performance on these tests, the notion of “failing schools” was created⁴ to define perennially low performing schools where school performance was defined as some combination of student achievement and student growth. Policy approaches have provided the “carrots and the sticks” to promote change through federal legislation such as the 2001 re-authorization of ESEA known as the No Child Left Behind (NCLB) Act (2001) and the 2010 Race to the Top (RTTT) competition for school transformation as part of the 2009 American Recovery and Reinvestment Act (ARRA)⁵ that provided incentives and penalties for schools failing to make progress on student achievement and growth measures. The corporate-funded American Legislative Exchange Council (ALEC) similarly developed its own conservative reform agenda⁶ that works across state legislative bodies to enact local policies that, along with legislation tied to NCLB and RTTT, have created a policy environment ready and willing to take on the challenge of perennially low achieving schools, at the expense of local control and often in support of privatization of schools.

These attempts have resulted in policies seeking efficient and transparent use of resources to reduce achievement gaps and increase student performance. A cacophony of approaches include: teacher incentives, smaller classroom student numbers, experiments with single gender schools, lifting limits to the number of charter schools to seed innovation, curricular focus on STEM or STEAM, creation of charter school networks, vouchers for families to remove students from public schools...all searching for the silver bullet that will rescue us from the abyss of perennial poor performance of so-called “low performing schools.”
Policy approaches to failing schools

Many states are developing policies to address the perceived challenges of low performing schools, many along the lines of the ALEC agenda. These policies include take-over and incubation approaches with the apparent intention of disrupting status quo and supporting innovation. Take-over strategies include state run districts that remove schools or entire school districts from the control of local boards and the influence of teachers’ unions, as was done in New Orleans with the Recovery School District (RSD) (and now, ten years later, is being un-done), and is being replicated in major cities across the US including Milwaukee, WI, Youngston, OH and Detroit, MI, to name a few. Often times, once a school or district is taken over, it is either managed by a charter management organization (CMO) or by a state-wide recovery district superintendent. Tennessee has recently developed policies that support school and district take-over strategies to create a state-run Achievement School District (ASD) with a combination of state-run and CMO schools.

Other policy considerations approach the challenges of “failing schools” by removing perceived impediments or constraints on schools to innovate. These efforts provide more flexibility and latitude for hiring and firing of school leaders and teachers, changes in the school day and calendar, and expectations for teacher and principal certification. Nashville’s “i-zone” (innovation zone) is a consortium of schools that continues under local control but without the same constraints such as traditional schools for hiring, firing and setting the school calendar. Although encouraging innovation is an important strategy, these attempts to encourage innovation are not systemic and maintain a traditional perspective of knowledge of content as measured by tests. Without changing how we identify low achieving schools, methods that take a percentage of the bottom schools will always ensure some percentage of schools as failing. Policy, in this case, creates and perpetuates the problem.

A serious concern with existing policy approaches to addressing failing schools is the validity of the underlying assumption that competition will make schools better. Approaches to inequities in learning opportunities for students that siphon off limited resources for public schools to support competition have not been shown to work in the long run and result in diminished resources for public schools7-8.

State policies that impact resources and strategies to address failing schools are changed with such frequency that it is often impossible to determine the impact of approaches to address educational inequities. We have seen this with the on-again, off-again adoption of the Common Core Curriculum and even with how low performing schools are identified. In North Carolina, for example, changing the definition of failing schools between the 2013-14 and 2014-15 school years resulted in an almost 68% increase of “failing schools” from 367 to 581 public schools ranked as low performing9 based on changes to the definition of failing schools.

The many cumulative ways we have chosen to measure educational success or define failing schools are fundamentally flawed and efforts to address extreme, existing disparities in educational opportunity are doomed to fail if we don’t address our ability to take on complex, interconnected problems in some way that doesn’t simply reduce those problems to simple causality. We need to develop capacities to understand complexity not as “complicated” but as interconnected and multidimensional. Strategies for addressing complex problems, then, honor and take advantage of the interconnected, multidimensional nature of complex problems. Finally, global solutions to complex problems require an understanding that local solutions are necessary. The “chaotic” mantra — “think globally, act locally” — reflects that complex problems need to have local solutions that vary with context while keeping in mind the large-scale problem. An approach to the challenge of educational equity that recognizes and embraces the pervasive, systemic, global challenge of schools reflects a systems approach that honors the dynamics and interconnectedness of local and social dimensions, understanding education as a key social institution.

Failure Factories — Local Approaches

As “failing schools” become part of the vernacular of educational reform policies, particular schools are labeled “failure factories” for their long-standing poor performance. Poor schools (and teachers) are blamed for youth incarceration rates and community poverty, resulting in local and state policy approaches to address the challenges of perennially low performing schools. Central to many of these efforts has been the importance of training and supporting quality teachers and school leaders. I-zone (short for “innovation”) schools in Nashville and transformational schools in North Carolina, for example, often begin with hiring a new school leader who either has experience with low performing schools, or has experience as a “turn around” specialist. While there are a few programs specifically designed to prepare turn around specialists, (the program at the University of Virginia as an example,10), typically, principals who have been successful in other settings and who are interested in taking on the challenge of a low performing school are targeted for this challenge. Occasionally, with mixed results11, individuals outside of education are recruited to become the school leader for turn-around efforts.

The first strategy for the turn-around school leader is to fire all existing teachers and hire a new staff. Existing teachers and non-instructional or support staff typically have the option to reapply for their positions. Hiring decisions are then based on teacher/staff willingness to adopt new strategies, as defined by the turn-around plan, and/or participate in developing a turn-around plan, often requiring buy-in for longer hours, less or loss of benefits, extensive planning, and additional accountability. In urban districts, teachers have more options to opt-out of turn-around efforts by transferring to different schools or changing
career paths; in more rural or economically depressed areas, teachers find themselves needing to “buy-in” to changes to continue in their career as a teacher in the troubled school with few options for other employment. (This strategy for hiring all new teachers for perennial low performing schools is often accompanied by state-wide policies that allow for removing or limiting teacher tenure.)

Typical turn-around strategies include longer school days, adjusted school calendars, more time for team planning, and curricular adjustments (including internship opportunities for students and focus on particular models of instruction such as problem-based learning). Although many state-wide efforts try to provide additional resources for turn-around schools, such as additional pay for teachers and support for school leaders who are spending more time to implement turn-around strategies, in many cases, these schools continue to operate with no additional resources. Also temporary additional resources at the outset are not sustainable in a culture where a “fix-it” mentality only provides temporary resources for extreme cases.

Although the success of turn-around strategies is mixed, with few actually showing long-term progress, there is a built in paradox that removes flexibility and resources as the crutches that made implementation of reforms possible. Both policy-level and school-level reforms must be addressed, along with societal commitment to transformation of schools as fundamental to the future of our civilized society.

Complexifying the problem

Einstein is noted as having said “Problems cannot be solved from the mindset in which they were created.” This statement is applicable to many of our greatest societal challenges, including the challenge of failing schools. What is needed is a different understanding of the problem and a broader perspective of what is important for the future. We begin with broadening our perspective of the role of education in the 21st century.

In the 1972 English version of German sociologist Jürgen Habermas’ book Knowledge and Human Interests, the technical control orientation of modern society was taken to task as detrimental to the future of civilization. There are three fundamental human orientations to the future as key aspects of human inquiry, according to Habermas: technical control, hermeneutical understanding, and emancipatory or generative creation. Modern science, he explained, achieved dominance in the 20th century with an over-emphasis on technical control, dampening human creativity and self-understanding. In the two volumes of The Theory of Communicative Action, Habermas later provided a systems perspective for addressing the future and avoiding over-reliance on technical control by extolling the importance of framing ways of thinking and defining intersubjective communication as a coordinated, dynamic approach to problem solving. The dimensions of human inquiry and futures thinking reflect the fundamental human interests as dynamic relations among technical control, interpersonal relationship, cultural understandings, and emancipatory futures.

Habermas’ expanded conversation across these domains of human inquiry reflects a social-systems perspective of complexity. Complex adaptive systems theory applied to social systems acknowledges the interconnectedness of social systems and the importance to the health of society for core social structures of education, politics, economics, health, and the law to be adaptive, responsive to environmental contexts, and open to change, as with biological complex adaptive systems, such as species or complex ecosystems, the ability to change as environmental forces change is key to survival. Habermasian human interests serve as a useful frame for untangling some of our most intractable problems in education from an holistic, social organizational, systems perspective. The goal is not to simplify problems, but to understanding their complexity within a complex, societal ecosystem. The problem of failing schools has technical, cultural, interpersonal, and futures challenges that require multiple strategies across many different levels and interconnected dimensions.

Public education as a complex adaptive system

A futures perspective of schooling embraces the hermeneutic and emancipatory dimensions of a Habermasian frame by recognizing students must be prepared for a world that is rapidly changing, and for jobs that do not yet exist. In the 21st century, learning skills will go far beyond “Readin’, (W)ritin’, and ‘Rithmetic” to include interpersonal collaboration and global participation in emerging economies that rely on innovation and creativity. When asked about what they want their new employees to know and be able to do, employers in survey after survey list communication, cooperation, collaboration, innovation and technology skills as important. These are important aspects of adaptation for uncertain and rapidly changing futures in the postmodern world.

The Framework for 21st Century Learning developed by the P21 Partnership for 21st Century Learning is one perspective of what is important for students to know and be able to do that has been adopted by many states (P21, 2006). The 21st century learning skills listed as important for students fall into the categories of Life and Career Skills (including flexibility, adaptability, initiative and self-direction, social and cross-cultural skills, productivity and accountability, and leadership and responsibility), Information, Media and Technology Skills (including the ability to access, evaluate and use information creatively to solve problems and share new understandings), Learning and Innovation Skills (including critical thinking, communication, collaboration and creativity), and subject matter knowledge framed within 21st century themes (that include global awareness,
financial, economic, business and entrepreneurial literacy, civic literacy, health literacy, and environmental literacy). These skills are captured in the inquiry web\(^1\) below across all areas of fundamental human interest.

From a complex adaptive systems perspective, student preparation for the future is dynamic across technical, interpersonal, cultural, and emancipatory dimensions. Knowledge, skills and dispositions are intricately woven in this web of interconnected human interests to prepare students for sustaining and advancing themselves in a rapidly changing world. Content knowledge is just one of many goals for students as they learn to navigate and create their future worlds. Personal autonomy, initiative, and responsibility along with the ability to work collaboratively, flexibly, and creatively across personal, social, and cultural settings are clearly delineated as important aspects of emancipatory, interpersonal and cultural dimensions of learning. Technical understandings and skills ensure key knowledge and preparation are included as core competencies for shaping individual and societal futures (see Figure 1 below).

![Fig. 1: 21st century learning attributes and skills from a complex adaptive systems perspective](https://journal.emergentpublications.com/wp-content/uploads/2016/08/a22431e4-e3dc-417f-bfbc-0189104c033e-300x169.png)

Content knowledge is a small, albeit important part of futures education, and teachers, and those preparing to become teachers, need to develop insights and perspectives that go beyond the goal of teaching students to do well on tests of content. To develop the knowledge, skills and dispositions for students to navigate their complex futures requires teachers to (a) be open to intellectual, personal and societal differences among their students, (b) understand there are multiple ways of knowing, (c) be supportive of connected thinking across human interest dimensions, and (d) appreciate global interdependencies. At the same time, teaching for the future ethos must embrace (e) networked knowing, (f) collaboration, (g) ambiguity, (h) creativity, (i) generation of new knowledge, and (j) technology. These key components comprise the “Second Enlightenment” perspective of a Communities of the Future (COTF) approach\(^2\) and offer a grounding for developing teacher cultural competence for 21\(^{st}\) century teaching and learning.

As depicted in the diagram below (see Figure 2), teaching competencies reflect the fundamental human interests as webbed relationships among technical, interpersonal, cultural and emancipatory dimensions of learning and interact across dimensions of student learning dynamics. Key strategies, such as uplearning and unlearning\(^2\), to promote emancipatory, futures thinking, combine with technical skills of using technology to communicate, collaborate and explore new ideas to support student development of critical thinking, learning-to-learn skills, and initiative and self-direction. Strategies that encourage students to seek patterns, develop hypotheses, and create solutions to real problems support students’ abilities to develop communication and leadership skills while becoming accountable for demonstrating their knowledge. These Teaching and Learning skills for 21\(^{st}\) century classroom support a complex adaptive systems perspective of preparing students to be autonomous, creative, life-long learners capable of working collaboratively and adaptively in the uncertain future that promises to include rapid changes in technology and other key social institutions including politics, law, and the economy.

![Fig. 2: Teaching and learning skills for 21st century classrooms from a complex adaptive systems perspective](https://journal.emergentpublications.com/wp-content/uploads/2016/08/f21e0375-7fdb-43b8-baa8-232587a055db-300x169.png)

**Networked approach to inquiry in complex social systems: The futures inquiry frame**

Using the futures inquiry webbed structure to understand the multiple dimensions of human endeavor, and articulating the requisite knowledge, skills and dispositions necessary for teaching and learning in the 21\(^{st}\) century, we now have a framework for addressing challenges to schooling. The two middle “rings” of this web reveal the perspectives of teaching and learning for the future across the domains of human interaction. A complex adaptive systems perspective grounds teaching and learning for 21\(^{st}\) century realities across these dimensions and reflects interconnected interdependencies as webbed relationships and unfolding dynamics. The web of relations provides guidance for an approach to inquiry that takes into consideration the dynamics of local action and global perspectives.
To use this Futures Inquiry Frame, specific environmental factors need to be known. The inner-most and outer layers of the Futures Inquiry Frame reflect local and environmental contexts relevant to the successful implementation of a 21st century teaching and learning approach. These factors vary and necessitate different strategies for addressing specific educational challenges (see Figure 3, below).

Fig. 3: Futures inquiry frame for guiding research approaches to complex educational challenges

To use this framework for addressing the specific challenge of perennially low performing schools, as an example, we can delineate the local and environmental challenges to create unique solutions for different contexts. The outer layer reflects policies, resources and external demands on the particular education system across the four domains of human inquiry while the inner circle describes specific challenges that have been shown to be relevant to school success and may impede student success in a particular school setting. We will use this multi-layered, interconnected, dynamic approach to consider how the challenges of low performing schools can be addressed by offering suggestions for how these two layers of the web might lend unique approaches for differing contexts. Rather than a one-size-fits-all strategy or cookie-cutter approach for addressing the problems of failing schools (or any large-scale educational challenge), this model accommodates context without reducing complexity so all of the “moving pieces” and dynamic relationships remain. Context is treated not as a qualifier but as a potential solution pathway. This model can be used for addressing the challenges of low performing schools, as well as to approach other seemingly intractable problems in education, and has implications for approaches to research methods, as described in the final section.

Complex futures inquiry frame approach to failing schools

Using the Futures Inquiry Frame for addressing 21st century problems in schooling, the local and educational environmental factors provide guidance for strategies that can be uniquely developed for particular school, district, or state reforms. There are broad categories of local and environmental factors that bear on school success. Addressing complex problems in education builds on traditional approaches to research by clarifying these factors as relevant to local contexts.

Local factors

Local factors that impact student and school success, as explored across numerous research studies and innovative practices, include the following:

- Teacher quality
- School leadership
- District leadership
- Local value of education
- Tolerance for risk-taking
- Support for innovation
- Culture of care
- Relationship focus

These factors represent perspectives across the fundamental futures dimensions of technical, interpersonal, cultural, and emancipatory understandings. The complexity of the local context is represented by the interplay among and potential tensions across these dimensions and educational strategies for improving schools. For example, hiring quality teachers may be difficult in schools where the school culture is not caring or in a district that does not support the belief that all students can learn or in a community that does not believe in the value of education. Teaching approaches that do not reflect 21st century teaching and
learning strategies and perspectives can similarly impede local efforts to improve schools by incorporating technology to allow students to define and address their own problems of learning and knowing. Classroom strategies that over-emphasize content knowledge do not provide students opportunities to innovate. Incorporating innovative approaches to teaching without changing the expectations for what students learn and assessment strategies that go beyond regurgitation of facts will not lead to sustained change in a 21st century learning environment. In this way, we can see from the diagram below (see Figure 4), how adding local contextual features to the Futures Inquiry Frame for 21st Century Schools provides multiple pathways and strategies for addressing local challenges to low performing schools.

![Fig. 4: Local context of 21st century schools from a complex adaptive systems perspective](https://journal.emergentpublications.com/wp-content/uploads/2016/08/c8c5a6d5-bcef-47d4-8840-77233c1a6896-300x168.png)

**Environmental context**

For sustained change and educational reform that impacts local and global educational contexts, educational environmental contexts also need to be addressed. Adding environmental factors as important to the consideration of educational reform is crucial for addressing complex educational challenges from a complex adaptive systems perspective. Minimally, external context variables include state-wide efforts to impact policies and provide resources to support change across teaching, learning, and local contexts. Social/environmental factors impacting school reform include:

- Policies
- Accountability structures and mandates
- Economic and financial support and incentives
- Social challenges of poverty
- Local challenges of high rates of childhood trauma
- Community inequalities perpetuated by education and other social institutions
- Cultural and environmental approaches to solving societal problems
- Politics

These factors, likewise, represent all aspects of the human interests dynamic and are captured by the figure below. Policies impacting grading schools implicates accountability measures and requirements. Environmental contexts such as poverty or social setting in a poor versus affluent community impact challenges of adolescent incarceration, hunger, or other childhood trauma factors. And the politics of education that is driven by ideology or even, perhaps, a political desire to destroy or refocus existing public education is connected to the policies governing and resources provided to schools.

Combined with teaching, learning, and local contextual dynamics, the social context of 21st century schools defines a complex web of interactions and co-dependencies across multiple dimensions of human experience and need (see Figure 5, below). The web of relations is dynamic in the sense that action taken connects across dimensions and requires continual reassessment and new action. In this way, the Futures Inquiry Frame requires on-going action-based solutions, avoids a one-size-fits-all solution pathway, and maintains a futures-orientation. Solving problems such as low performing schools, then, requires specific attention to all variables, taken together.

![Fig. 5: Combined with teaching, learning, and local contextual dynamics (Image not readable or empty)](https://journal.emergentpublications.com/wp-content/uploads/2016/08/c8c5a6d5-bcef-47d4-8840-77233c1a6896-300x168.png)
Role of educational research

Using the educational Futures Inquiry Frame (see Figure 6) to address significant educational challenges has implications for educational research. Re-searching as a recursive exploration of educational innovation requires re-exploration of the impact of innovation as conditions and contexts change and are framed in a futures orientation. For example, we have a large body of research that shows the importance of school leaders in turn-around efforts for low performing schools. Sustainability of turn-around strategies, however, has proven to be elusive. This may, or may not be a matter of the school leader, per se, but a combination of factors, for example, as turn-around efforts are introduced there is lack of on-going and appropriate support, intentionality, or adaptation. Certainly resources such as additional pay for teachers, external mentoring of teachers and school leaders, and the addition of support staff for implementing curricular reforms or introducing technological innovations are finite and there is evidence that sustainability of reform needs to take into consideration how the infusion of resources can be tapered off without delivering a setback to the reform efforts. Policy changes also impact sustainability of innovation and reform efforts. The Race to the Top program is an example of how a massive infusion of money to implement reform strategies has not been sustained once the RTTT program and resources ended while system changes have failed to provide for evolutionary change to the system. Policies put in place by states receiving RTTT funding are being dismantled as states reject the federal oversight imposed by RTTT mandates and as testing mandates required by NCLB are changing as a result of the Every Student Succeeds Act (ESSA, 2015) replacing NCLB as the latest version of the Elementary and Secondary Education Act was recently approved.

Complexity research has a role to play in supporting and sustaining educational reform and futures perspectives by providing a layered approach to research. We also need traditional research that can isolate and control variables to provide insights into impact, but we also need strategies that explore system-wide dynamics across time and contexts. The Futures Inquiry Frame provides some guidance for which variables and interactions of variables we should keep in mind as system dynamics are explored without reducing inquiry to a hyper-rational, overly simplistic approach to truth. The Futures Inquiry Frame integrates individual and social worlds by connecting the web of interdependencies of human endeavor within the social context of education. A layered approach to research re-considers and re-examines findings, across multiple dimensions and settings, building in a recursive “inquiry of inquiry” approach to educational research and implicating the need for more complex methods and futures perspectives. Networked interactions propel and promote a futures-orientation to educational research as researching is both forward looking and perspective grounding. Key factors of educational re-search include: treating time as a variable, understanding system openness, incorporating system feedback, and embracing perturbation as important for whole-system perspective of the interconnected web of educational futures. Each of these will be described, below, in the context of addressing the problem of low achieving schools.

Time as a variable

Techniques in the sciences have been developed to explore chaotic systems using time as a variable to understand the complexity of unfolding dynamics across time. We see this with the phase-space representation of the logistic function that reveals the complex dynamics of a system, over time, that never repeats a previous state but has interesting, emerging patterns that allow for knowledge at a systems level. Logistic maps were used by Lorenz and other dynamicists to explore complex weather patterns, giving an image for the “butterfly effect” as an embodiment of unfolding system dynamics that are sensitive to initial conditions, chaotic, yet patterned as seen by the “strange attractors” that become the two wings of the metaphoric butterfly (see Figure 7 below).
With standardized testing, we have limited our understanding of student learning by creating time-slices of achievement, typically only once a year in the spring, rather than developing strategies for understanding how learning unfolds for individual students as well as for classes, schools and communities of students. Treated as a dependent variable, time is recursed, i.e., fed back into the system as a dependent variable and incorporated into human experience across multiple dimensions. The inquiry web provides some guidance for how the unfolding of learning, treating time as a dependent variable, might occur across student-teacher dimensions (see Figure 2) to include technical, interpersonal, cultural and emancipatory perspectives. Demonstrating knowledge of key mathematical concepts, for example, may occur across learning contexts and unfold as students create and seek solutions to their own problems, using a variety of tools for a variety of purposes, in a variety of problem settings. While portfolio assessment is one means of getting at the evolution of learning, a curriculum that treats all learning as a dynamic unfolding requires even more dynamic tracings of learning dynamics while (e)liminating piecemeal learning outcomes in favor of larger, more encompassing knowledge, skills and dispositions. The key ideas of algebra, for example, may be reduced to three key constructs, namely balance, variable, and the relationship between geometric and algebraic representations of functions. Rather than trying to determine whether a student has developed algebraic skills necessary to survive in higher mathematics or world problems by collecting specific problem solution types, it may be more important to trace how these three fundamental aspects of algebra evolve and are used in a variety of problem settings across the dimensions of human endeavor and student futures learning.

Treating time as a dependent variable also has implications for addressing local and societal challenges. For example, we have research that shows the impact of hunger, abuse, and other childhood traumas on student learning both in the long term and short term. Part of the networked approach to understanding individual student learning needs to connect these aspects of human experience as learning unfolds. The challenge of keeping a learning trajectory going, across time, may be to ensure health and poverty issues are addressed. So, while teaching and learning dynamics may gain insights by treating time as a dependent variable as learning unfolds, whole-system perspectives cannot be ignored. This is where a systems perspective both needs to be maintained and opened up to inquiry as adaptive response to inquiry occurs.

**System openness**

A complex adaptive systems perspective of education necessitates system openness, especially in highly volatile and rapidly changing social environments. Take, for example, the challenge of low achieving schools. While a systems approach should include changes in testing or other legislative mandates, some other environmental factors may need to be accommodated. The economic down turn of 2008 is a recent example of how other social systems, in this case, the economy, impact education as a social system. Because education does not operate in isolation, as a system, education needs to be able to anticipate, shape, when possible, and adapt to environmental and other social systems challenges. Some would argue that public education, as a whole, is a dinosaur on its last legs toward extinction because it has not adapted, as a social organization, and is not prepared for 21st century realities. The same argument can be made for higher education in the US. Once the envy of the rest of the world, US higher education has not adapted to the challenges and realities of the 21st century. The question is, can education, as a whole, adapt to these challenges or will education, core to the modern social fabric, become obsolete and go the way of the dinosaur?

What does it mean for a social system to be open? Using the human body as an example, we survive biologically because we take on nutrients and expel waste. But our body, itself, is open in many other ways. Our skin is porous so we can interact with our environment. Skin insulates and moderates body temperature. Sensation and the absorption of nutrients through the skin requires an openness to the environment essential for whole-system health. Our eyes, ears and nose similarly provide input to our system so we can anticipate and meet existing challenges and threats. The immune system ensures system health by being open and responding to pathogens. Our intellect is a special category of human openness to environmental conditions that provides for strategic and learned response to environmental threats and opportunities.

Education, as a social system interacts across the human social systems of politics, economics, religion, and the law to address environmental challenges and take advantage of environmental opportunities. To be open, education needs to recognize these interconnections and dynamics. Similarly, as with the human body, the health of the system, itself, needs to be maintained and therefore the education-body itself needs to be open to and aware of internal, auto-immune responses to internal and external threats and opportunities. Timely feedback is essential to an open systems response.

**Feedback as continuous improvement**

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As a complex adaptive system requires openness as a key function of adaptation, system feedback is necessary for both system maintenance as well as system response to anomalous situations. The skin, as an example of an open system, provides feedback to our body to ensure proper body temperature. If it is too hot, we sweat; too cold, and we adapt by reducing the loss of body heat.

We tend to isolate information in education to provide different kinds of feedback for different subsystems without considering fundamental regulatory principals of system health. Even describing the challenge of educational equity as an issue of failing schools reveals a misplaced emphasis on "schools" without understanding the key challenges of failing schools, namely, unequal opportunity to learn. The Futures Inquiry Frame represents the complex dynamics across local and environmental contexts, as well as across technical, interpersonal, cultural, and emancipatory dimensions of teaching and learning. While we can trace learning opportunities across these dimensions, each component of the system provides important and useful feedback. How does having a large proportion of kids in poverty impact student opportunities to learn? How do relationships in the classroom or access to technology impact teaching strategies and access to new ideas? How do policies and politics in education impact a teacher’s willingness to take risks or innovate in the classroom? The Futures Inquiry Frame provides a kaleidoscopic perspective of the educational system with each turn of the frame providing useful feedback for improving the system.

**Perturbation as a driver**

As feedback to the system drives future action and adaptive responses to challenges to learning opportunities for children, perturbation can serve either to dampen adaptive response or as a driver to promote change. Because education is a complex social system with interactive dynamics across many dimensions of social and human interests, we have tended to "pick our fights" and ignore challenges to system integrity by pursuing solutions that seem manageable. We feel we can’t address childhood trauma, so we ignore it as we adjust education policy to stay focused on teaching and learning variables that we feel can be controlled. The problem with ignoring serious challenges to system health, however, is ultimately, system health is compromised and death may occur. Is this where we are with public education?

Healthy systems accommodate perturbation as a mechanism for adaptive response to challenging situations. Whether the perturbation is internal, such as an auto-immune response in the body, or external, such as being in an environment that is too hot, an adaptive systems response recognizes the perturbation as important information and responds appropriately. For too long, our research methods and policy approaches to educational challenges have ignored the "too difficult to accommodate" perturbations as beyond the scope of our efforts, or worse, ignored them, like the frog who doesn’t recognize the water is getting hotter and hotter until it is boiled to death.

The Futures Inquiry Frame stays focused on future system health and has a built-in mechanism for adapting to perturbation across multiple dimensions. In the case of childhood trauma, for example, rather than ignoring it, the Frame may suggest different responses and actions to accommodate those challenges. The system, in this way, treats threatening feedback to system health as contextual and localized, ensuring an efficiency of resources and responses that are relevant to particular situations and threats.

**Futures inquiry frame as the mandala of education systems transformation**

Whether visual or metaphorical, when addressing complex problems, it helps to have an analogous approach to problem solving. Goethe’s entire scientific enterprise was based on such an approach to science as a metamorphic process for the scientist in interaction with the world[33–34]. His process perspective of inquiry is relevant to the perspective of complex adaptive systems that are ever changing and dynamically in relationship. At the same time, things are knowable only as human efforts to solve them, evolving humanity in the process. Ultimately, controlled, experimental design is enhanced by analogical reasoning that supports knowing across multiple dimensions and domains and supports our evolution as an adaptive, learning organization.

A complex adaptive systems perspective of education requires a similarly dynamic approach to research that recognizes the known and knowable are intertwined and transformed through the process. The Futures Inquiry Frame provides practical guidance for approaching educational challenges such as failing schools without reducing complex problems by disentangling them from their local and social contexts and toward adaptive change and transformation of the educational system. But, as a technique, and perhaps most importantly, as a futures question, the real question about trying to solve complex educational problems is “why?.” The “why” of research approaches to educational challenges is, itself, intertwined across technical, cultural, interpersonal and emancipatory dimensions. To employ Goethe’s analogical approach, one might imagine the Futures Inquiry Frame as a mandala, pictured below.

![Image](https://journal.emergentpublications.com/wp-content/uploads/2016/08/e3c0a8fe-93a3-4df5-a512-a4b6a4a9a73d.png)
The mandala is a geometric representation of the Hindu perspective of the universe. The mandala wire toy many of us have seen in mathematics classrooms captures the unfolding, enfolding and emergent properties of a network of relations that comprise the mandala. From the Hindu perspective, we experience these interconnected forms of the universe, often times failing to understand the unity of the universe. As a psychoanalytic tool, the mandala is used to focus attention without losing site of the whole. Even as a puzzle, the layered connections of the mandala require constant refocusing on connections across and among layers of complexity.

The “why” of the Futures Inquiry Frame is like the mandala. It is a tool for focusing attention without losing sight of the whole. It is also a way of approaching system-level problems without reducing complexity of system dynamics and supporting adaptation as a goal for system health. Any time one attempts to provide a “method” of research, the “re” of re-search is lost. We expect final answers rather than evolutionary strategies for adapting ourselves and the system we are investigating. Addressing fundamental challenges of education, such as educational inequity, is an overwhelming task, however, without a place to start, and bringing to bear existing understandings. The Futures Inquiry Frame treats re-search both as recursive understanding and dynamic, futures creation. As sociologist Richard Ogle describes,

Western education is based on two assumptions, rationality and knowledge that already exists…and, by definition, looks backwards. In a time of exponential change, new skills of intuition, insight, imagination and innovation will be key…and, by definition, looks forward. – Richard Ogle

Footnotes

1 Special thanks to Linda Quinn of Tarrant Community College and Rick Smyre of Communities of the Future for seeding the idea of inquiry maps from their usage of transformational webs to support a complex adaptive systems perspective of student success.

2 As described by Smyre & Richardson, “It is not that we are to cast away content of appropriate knowledge, it is that we need to unlearn many old “truths,” one of which is that there is only one answer to all situations and issues. Once we learn how to unlearn inappropriate ideas and remove obsolete knowledge, we can learn how to unlearn, to think and act at a higher level of complexity.”

3 https://commons.wikimedia.org/wiki/File:Lorenz_attractor_yb.svg

References


